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EDISON ELECTRIC INSTITUTE BULLETIN

In Two Sections— —Section One

JANUARY, 1936

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EDISON ELECTRIC INSTITUTE

STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry

DURING THE MONTH OF NOVEMBER (Preliminary)

	1935	1934	%
Kilowatt-hours Generated* (net)			
By Fuel	5,163,141,000	4,405,266,000	+17.2
By Water Power	2,951,182,000	2,697,870,000	+ 9.4
Total Kilowatt-hours Generated	8,114,623,000	7,103,136,000	+14.2
Additions to Supply			
Energy Purchased from Other Sources	171,646,000	153,693,000	+11.7
Net International Imports	61,945,000	68,330,000	− 9.3
Total	233,591,000	222,023,000	+ 5.2
Deductions from Supply			
Energy used in Electric Railway Departments	47,394,000	52,252,000	− 9.3
Energy used in Electric and Other Departments	103,605,000	112,151,000	− 7.6
Total	150,999,000	164,403,000	− 8.2
Total Energy for Distribution	**8,197,215,000**	**7,160,756,000**	**+14.5**
Energy Lost in Transmission, Distribution, etc.	**1,270,454,000**	**1,171,464,000**	**+ 8.5**
Kilowatt-hours Sold to Ultimate Consumers	**6,926,761,000**	**5,989,292,000**	**+15.7**
Sales to Ultimate Consumers (kw-hrs)			
Domestic Service	1,288,842,000	1,168,382,000	+10.3
Commercial—Small Light and Power (Retail)	1,292,520,000	1,157,401,000	+11.7
Commercial—Large Light and Power (Wholesale)	3,623,699,000	2,988,809,000	+21.2
Municipal Street Lighting	216,689,000	203,388,000	+ 6.5
Railroads—Street and Interurban	368,035,000	360,936,000	+ 2.0
Railroads—Electrified Steam	78,756,000	56,388,000	+39.7
Municipal and Miscellaneous	58,220,000	53,988,000	+ 7.8
Total Sales to Ultimate Consumers	6,926,761,000	5,989,292,000	+15.7
Total Revenue from Ultimate Consumers	$169,399,300	$160,450,500	+ 5.5

DURING TWELVE MONTHS ENDING NOVEMBER 30th

Kilowatt-hours Generated* (net)			
By Fuel	54,997,397,000	53,172,174,000	+ 3.4
By Water Power	36,354,580,000	30,796,955,000	+18.0
Total Kilowatt-hours Generated	91,351,977,000	83,969,129,000	+ 8.8
Purchased Energy (net)	3,026,542,000	3,076,689,000	− 1.6
Energy Used in Electric Railway and Other Departments	1,941,117,000	2,010,867,000	− 3.5
Total Energy for Distribution	**92,437,402,000**	**85,034,951,000**	**+ 8.7**
Energy Lost in Transmission, Distribution, etc.	**15,785,433,000**	**14,688,552,000**	**+ 7.5**
Kilowatt-hours Sold to Ultimate Consumers	**76,651,969,000**	**70,346,399,000**	**+ 9.0**
Total Revenue from Ultimate Consumers	**$1,911,424,800**	**$1,829,366,300**	**+ 4.5**
Important Factors			
Percent of Energy Generated by Waterpower	39.8%	36.7%	
Average Pounds of Coal per Kilowatt-hour	1.44#	1.45#	
Domestic Service (Residential Use)			
Average Annual Consumption per Customer (kw-hr)	668	629	+ 6.2
Average Revenue per kw-hr (Cents)	5.06¢	5.31¢	− 4.7
Average Monthly Bill per Domestic Customer	$2.82	$2.78	+ 1.4

BASIC INFORMATION AS OF NOVEMBER 30th

Generating Capacity (kw)—Steam	23,727,525	23,767,000	
—Waterpower	8,964,765	9,023,400	
—Internal Combustion	499,500	468,500	
Total Generating Capacity in Kilowatts	33,191,790	33,258,900	
Number of Customers			
Farms in Eastern Area (Included with Domestic)	(568,848)	(517,322)	
Farms in Western Area (Included with Commercial—Large)	(215,720)	(209,728)	
Domestic Service	21,001,610	20,473,539	
Commercial—Small Light and Power	3,806,835	3,728,106	
Commercial—Large Light and Power	510,898	528,528	
Other Ultimate Consumers	68,691	69,780	
Total Ultimate Consumers	25,388,034	24,799,953	

* By courtesy of the U. S. Geological Survey with deductions for certain plants not considered Electric Light and Power Enterprises.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume IV JANUARY, 1936 No. 1

The Electric Light and Power Industry in 1935

By Thomas N. McCarter

President, Edison Electric Institute

A REVIEW of the electric light and power industry during the past year discloses two contradictory trends. From the short-term standpoint, the operating results in 1935 showed improvement on every hand. From a longer point of view, the year marked the further approach of a possible crisis between the utilities and the Federal Government and the attempted imposition of the sentence of death upon some of the utility holding companies.

The immediate effect of the political attacks upon the power and light industry has been to add greatly to the uncertainties of the future, with the result of the postponement of most things which are not of immediate pressing concern. New financing and new construction remain at the lowest levels of the depression and the downward trend of rates, whereby the benefits of improved engineering and management have been passed on to the consumer, has slowed down since the passage of the Public Utility Act. In one respect, however, the stockholders of the industry have been benefited from the hesitation of current business, in that the low level of interest rates resulting from the accumulation of unproductive funds has enabled many companies to refund part of their indebtedness at lower figures.

The electric light and power industry has shared in the recovery of general business which continued throughout 1935. By August, output was back again to pre-depression levels. During December it exceeded the 1929 figures by nearly 8 per cent, and established a new high record for electric power production. New high records were made in the extension of service to the homes and farms of the country and in the use of this service by the individual consumers.

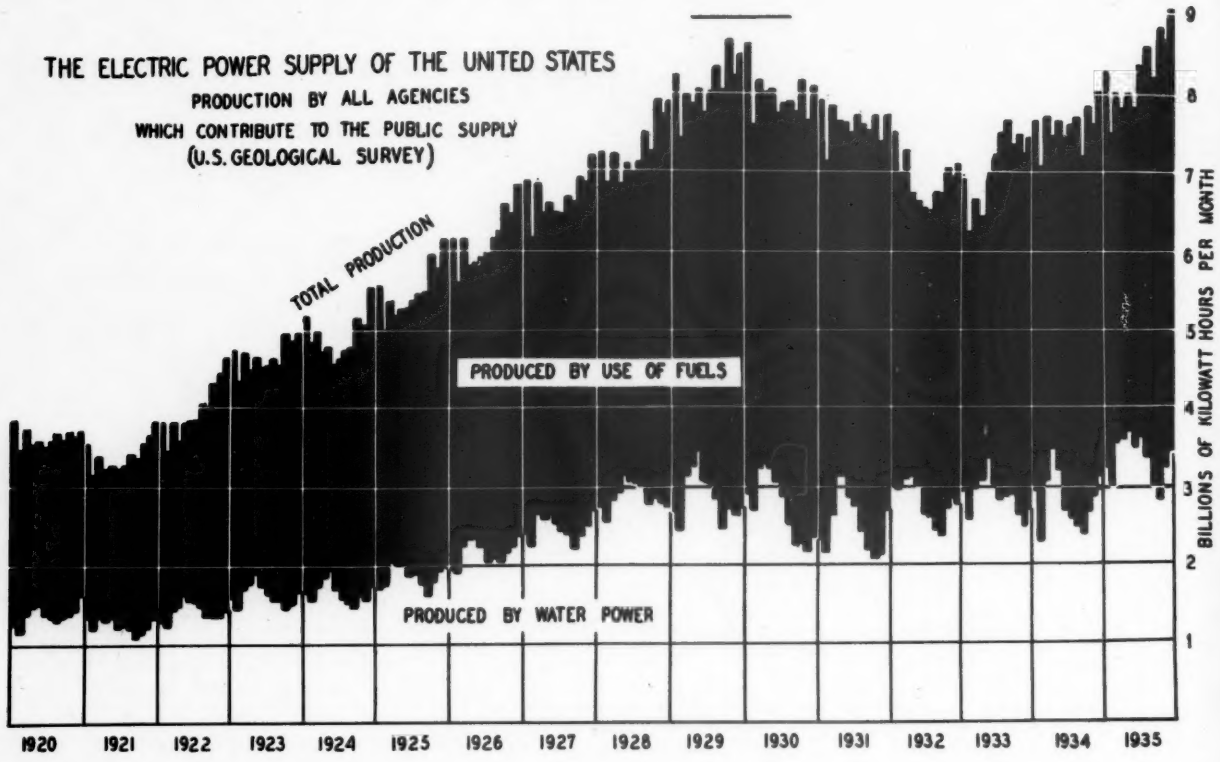
On the other hand, the long shadow of Government competition moved appreciably closer during the year. The highly unfavorable factor of further appropriations of Federal funds to develop water power in competition with private capital invested in plants already amply able to serve their communities was accentuated by subsidies from the Federal treasury to municipalities to set up electric plants in opposition to those operating under franchises properly granted. The most significant event of the year was the passage by Congress of the Public Utility Act of 1935, providing for far-reaching changes in the organization and operation of the industry, for its practically complete regulation by Federal agencies and for the dissolution of a large proportion of the holding companies. The validity of this Act has been challenged and the litigation already begun will ultimately reach the United States Supreme Court.

Operating Results

A new high record was set in the sale of over 1,500,000 electric refrigerators and the use of lighting was further stimulated by the continuation of the "Better Light-Better Sight" promotional campaign. Large gains were also made in the sales of ranges, washing machines and some of the smaller household appliances. The further extension of lines to rural areas and the return of "doubled-up" families to their original status resulted in the addition of 500,000 domestic users and, as a result of these factors, the total sales of electricity for domestic use exceeded the figures of the previous year by 8 per cent, and established a new record of about 13,875,000,000 kilowatthours.

The entire production of electricity in 1935 for all public purposes (including subways and traction systems) is estimated at 99 billion kwhr—an increase of 9 per cent over 1934 and 2 per cent over the previous high point reached in 1929. Industrial power sales were up 11 per cent, reflecting the increase in factory production during the second half of the year, but sales in this classification were still 10 per cent below 1929. Commercial sales reflected the slower rise in retail trade and showed an increase of 7 per cent over 1934. Street lighting, while up 6 per cent from the previous year, was still below the figures for the depression years of 1931 and 1932. Sales of electricity for street railway purposes were the same as for 1934, while current used by electrified steam railroads increased by 16 per cent largely as the result of the completion of the Pennsylvania Railroad's electrification project between New York and Washington.

Hydroelectric power regained its normal proportions, due to copious precipitation on both the Atlantic and Pacific coasts. Output approximated 40,000,000,000 kwhr for all enterprises which contribute to the public supply; an increase of about 6,000,000,000 kwhr or 17½ per cent above the figures for 1934 and also establishing a new record. Production of electricity by the use of fuels showed an increase of about 2,000,000,-


THE ELECTRIC POWER SUPPLY OF THE UNITED STATES
PRODUCTION BY ALL AGENCIES
WHICH CONTRIBUTE TO THE PUBLIC SUPPLY
(U.S. GEOLOGICAL SURVEY)
TOTAL PRODUCTION
PRODUCED BY USE OF FUELS
PRODUCED BY WATER POWER
BILLIONS OF KILOWATT HOURS PER MONTH
1 2 3 4 5 6 7 8 9
1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935

000 kwhr or 4 per cent above 1934, and approximated 59,000,000,000 kwhr.

The number of consumers showed an increase of about 550,000 to a grand total of 25,350,000 at the end of 1935. The number of farms served by utility lines increased by some 40,000 during the year to a total of 785,000. As in recent years, however, some of these were not real "farms"—in the sense that they were occupied by persons making a living from agricultural pursuits—but were farm properties which had been bought by city people as a hedge against inflation.

Rates

In accordance with the usual practice of the industry the level of rates was again lowered during the year for practically every class of consumers. Except for a few months during the war, the average price of industrial power was the lowest in the history of the electric industry. At the end of 1935, the average price of electricity for household use stood at 5.04c. per kwhr as compared with 5.3c. for the preceding year. Since 1913, the average price of domestic current has declined by 42 per cent although the general cost of living still remains some 40 per cent *above* the 1913 level. The domestic consumer's average bill is only 9 cents a day and the average family spends less for electricity than it does for tobacco or confectionery. For every penny that the typical American family spent for electric service in 1935, it spent more than 22 cents on the cost of government. If, instead of building competitive plants at the taxpayers' expense, the Government really desires to help its subjects struggling under a rising cost of living, it might with far greater profit devote its energies to a reduction in its own cost.

Finances

Due to reduced rates for all classes of service, gross revenues showed a much smaller rate of gain than kwhr sales and approximated $1,917,000,000 for the year 1935. While this represented an increase of $80,000,000 or 4 per cent over the previous year, it still was $74,000,000 below the figures for 1930, the high record for the industry. A large part of this gain in revenues over 1934 was consumed in the higher cost of doing business. Taxes continued their upward march and approximated $260,000,000 or 14 per cent of revenues from consumers. For fifty-one days out of the year the utilities work for the Government alone.

Although actual maturities totaled only $140,000,000 electric utility companies were able to take advantage of favorable conditions in the money market to execute a large amount of refinancing up to the time when the Dec. 1st "deadline" of the Utility Act put an end to further capital issues. A total of nearly $1,100,000,000 in securities was issued during the year by utilities furnishing electricity as compared with $131,000,000 the year before. Of this year's total, however, less than $50,000,000 can be set down as new capital, which compares with an annual average of about $650,000,000 for the decade prior to 1931.

Outlook for 1936

In looking forward to the new year, a conservatively optimistic attitude seems warranted as to the operating results of the electric light and power industry. The holding of its gains by business in general and the carrying over into next year of the satisfactory results of electric appliance sales are favorable factors. It is to be hoped that the Government will realize the impossibility of spending its way into prosperity and that the saturnalia of Federal expenditures on competitive electric plants has passed its peak. Until, however, the courts have clarified the position of the utility companies under all the legislation of the past three years, the position of the investor will remain increasingly uncertain.

Rural Electric Service in Ontario

After Twelve Years of Intensive Effort and All Kinds of Subsidies, Results Emphasize Inherent Obstacles to Farm Electrification—As Elsewhere in Canada, Very Low Rates Are Enjoyed Only by Those Using Electricity for Cooking and Heating.

By William M. Carpenter
Economist, Edison Electric Institute

THE operations of the Hydro Electric Power Commission of Ontario may be said to constitute the outstanding test of the inherent possibilities of rural electrification under most favorable conditions. Here a good technical job has been done; here is the most prosperous farming territory in Canada; here half the cost of lines is frankly assumed by the taxpayer; here exist all sorts of subsidies in the shape of loans and free service; yet, if the extent of use is any measure of success, there is an obvious disparity between the actual results and those that might have been expected from the time, effort and money expended.

The practical obstacles and inhibitions which must be removed before widespread electrical use is attained are well illustrated by the results in Ontario for, in spite of all that the "Hydro" has done, barely one farm out of every six in the more densely settled area in which the "Hydro" systems operate uses electricity and this use is, for the most part, on a comparatively limited scale.

All this raises the question of how much in actual practice electricity is worth to the farmer and, at the present moment, an analysis of the "Hydro" policies is of interest because of their contrast with those in the United States. The prices are of particular concern because, even with its heavy subsidy, the Ontario rate structure is a much more trustworthy yardstick of the actual cost of farm service and of the results that might be expected than is the unseasoned rate adopted by the TVA, with the extravagant predictions of its benefits.

Extent of Farm Service in Ontario

Most of the wealth and population of Ontario is located in a small area in the extreme southwestern corner, now served largely by the Niagara System of the "Hydro." This is emphasized by the following table, which shows a remarkable concentration of population in a very small portion of the Province:

	Approximate Land Area		Approximate Population		Population per
	Square Miles	Per Cent	Number	Per cent	Square Mile
South of Lat. 45° N.*.....	31,330	8.6	2,680,500	78.1	85.6
North of Lat. 45° N.*.....	331,952	91.4	751,183	21.9	2.3
Total Ontario.....	363,282	100.0	3,431,683	100.0	9.45

*The northern border of New York and Vermont.

The bulk of the wealth of Ontario's agricultural industry had always had its source in the small area south of the 45th parallel. It was this agricultural prosperity, previous to 1910, which created the closely-grouped industrial communities in the southwestern peninsula which now embraces the Niagara System and which in turn constituted the agency through which Ontario's plan of cooperative municipal electric systems became an economic possibility.

Rural service in Ontario is thus largely concentrated in the thickly settled and highly industrialized Niagara System. At the end of 1934, 22,656 or 78½ per cent of the 28,859 farms served by the "Hydro," were in that territory.

The following table shows the relative density of farm consumers on the "Hydro" lines; they compare with a figure of 25 per cent for the entire state of Michigan and 36 per cent for New York:

System	Approximate Number of Farms	Number on "Hydro" Lines October 31, 1934	
Niagara	85,000	22,656	26.7%
Eastern Ontario.....	61,000	4,105	6.7%
Georgian Bay.....	29,000	1,880	6.5%
Elsewhere	18,000*	218	1.2%
Total	193,000	28,859	15.0%

*Note: It is not perhaps quite fair to include all of these farms in the calculation of the percentage served. Many of them are far from centers of population and miles away from power lines and will never have electricity. Yet this is usually done when the degree of electrification of the United States is discussed by those who are most emphatic in their denunciation of "Backward America."

It is a trite axiom that the distribution of rural electricity is most fully developed in those areas where the general prosperity of the farmer is greatest. As has been similarly observed in the United States, the excellent marketing conditions for farm produce resulting from close proximity to urban centers in Ontario have been the most important factors in the progress and distribution of rural service by the "Hydro." This has given rise to the impression that these areas have become prosperous because electricity has been made available to them. The facts, however, show that they always have been prosperous and that electrification has made the best progress here because this region constituted the greatest potential market and the cream of the business.

Growth of Rural Service in Ontario

Figures usually quoted as to "Hydro's" rural service include much besides farming. It is just as true in Ontario as in the United States that there are more people living in the country who have nothing to do with farming than there are people actually on farms. The latest report (for 1934) shows a total of 63,840 consumers on the Hydro's rural lines, but of these 34,981, or 55 per cent of the total, are not farmers, but "hamlet" residents.

The following table shows the development of the number of consumers on the "Hydro" rural lines:

NUMBER OF CONSUMERS—RURAL POWER DISTRICTS

On Oct. 31:	Hamlet	Farm	Total	Annual Increase of Farm Consumers*
1923	3,071	2,170	5,241	.....
1924	7,007	2,253	10,260	1,083 or 50%
1925	9,394	4,505	13,899	1,252 or 38%
1926	12,256	6,598	18,854	2,093 or 46%
1927	15,526	9,757	25,283	3,159 or 48%
1928	18,069	12,994	31,063	3,237 or 33%
1929	21,197	16,143	37,340	3,149 or 24%
1930	25,355	21,360	46,715	5,217 or 32%
1931	30,195	25,406	55,601	4,046 or 19%
1932	32,250	27,284	59,534	1,878 or 7%
1933	33,765	28,080	61,845	796 or 3%
1934	34,981	28,859	63,840	779 or 3%

*It is quite possible that the increments of users during earlier years were not all new consumers; in 1926 the report showed 1992 hamlet and 747 farm users served by various municipalities beyond their own corporate limits. As the reports no longer carry these, it is possible that they have been largely transferred to rural power districts.

Ontario Rural Service Does Not Pretend to Be Self-Supporting

Rural service in Ontario is not regarded as a business undertaking which must pay its own way, but as a governmental function for the benefit of the people as a whole.

"The assistance given by the Province to farmers toward the capital cost of supplying electric service is in pursuance of a long-established governmental policy of promoting agriculture—a policy which had previously found expression in the establishment of agricultural schools, colleges and experimental farms, in assistance to road building and in other ways. The assistance thus given makes it possible to extend electric service into certain districts relatively thinly populated and so far from sources of electrical supply that service would not otherwise be financially feasible." (Annual Report for 1924, p. 66.)

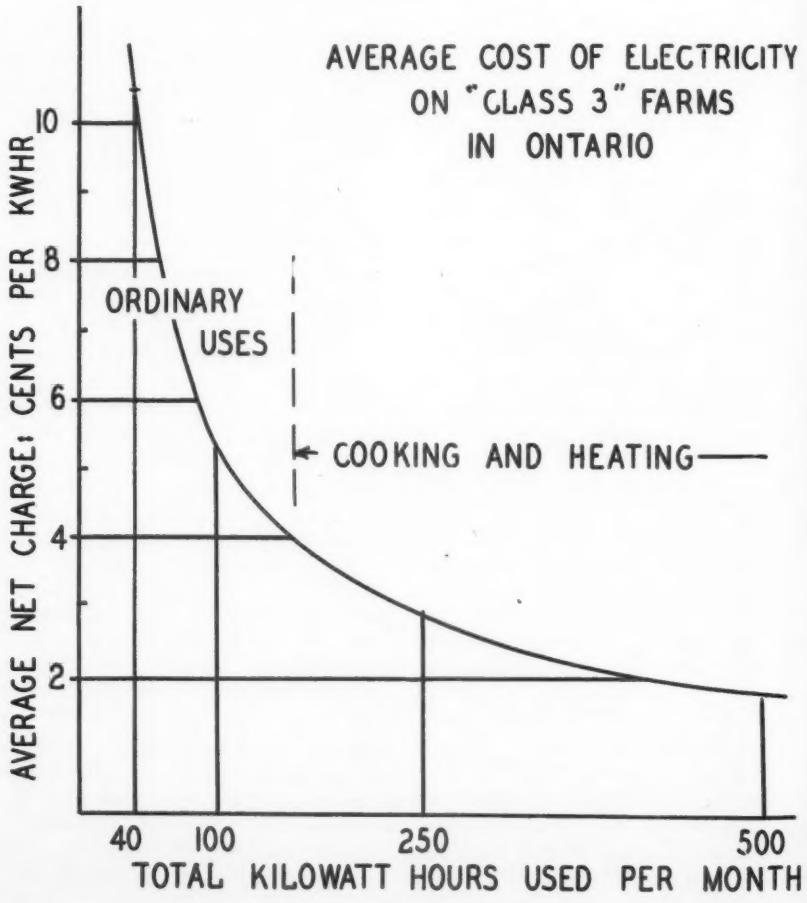
Subsidies from the Provincial Government

In 1921, an act was passed providing for the granting by the Provincial Government of half the cost of all primary lines constructed by the Hydro Electric Power Commission in the rural power districts. The payments were to be made out of the Provincial Treasury. In 1924 the act was amended to provide for including transformers and secondary equipment in the 50 per cent grant as well as the primary lines. In 1930 an act was passed to authorize advances toward the installation of electrical appliances in rural power districts. This permitted loans for wiring of premises of the consumer and for the purchase of motors and appliances. The same year another act was passed which authorized the Province to guarantee the maximum service charge of farmers, the Provincial Treasury being committed to make up any resulting operating deficit on the part of the Hydro Electric Power Commission. Commencing November 1, 1934, and for a period of three years thereafter, the Commission will also provide current free of charge to operate electric washing machines, licensed a-c radios and electric pumps to provide water under pressure for household sanitary systems.

Rural Areas Carefully Selected

"Primarily, rural service is made possible by the great networks of transmission lines which have been constructed to serve urban municipalities. These networks afford a base from which rural primary lines may economically be extended over wide areas of the more closely settled parts of rural Ontario." (Annual Report for 1933, p. 70.)

"An important factor in connection with rural power supply is the stability of rates charged. Since service is given at cost and since it is the policy to give service whenever economically practicable, it is necessary, in the interests of the rural consumers themselves, to insure by contract a certain minimum return from each mile of line constructed. Otherwise, if one or two prospective consumers failed to take service it would place an unfair burden on those who did. Experience has led the Commission to adopt the safe policy of constructing rural lines only when sufficient contracts have been signed to guarantee payment of the fixed charges on their cost; the minimum signed contracts required being three ordinary farm contracts, or their equivalent, per mile of



line constructed." (Annual Report, 1933, p. 79.)

Cost of Lines

The Commission's reports show the expenditures for construction of primary lines in recent years, as follows:

Year	Miles of Primary Line	Total Cost	Cost per Mile
1926	751.4	$1,514,795	$2,016
1927	875.3	1,919,404	2,193
1928	956.5	2,268,178	2,371
1929	1,157.3	2,668,241	2,306
1930	1,893.7	4,083,840	2,156
1931	1,249.0	2,644,702	2,118
1932	523.9	1,123,742	2,145
1933	246.5	590,862	2,397
1934	287.0	605,224	2,109

Rate Structure

Rates to rural consumers are based upon service "at cost"—account being taken of the Provincial "grant-in-aid" for rural work and the operation of the provision for a maximum service charge and, as in urban centres, the rates are made up of two parts, a service charge and a consumption charge. The service charge depends primarily upon the individual's connected load or demand which determines the consumer's "class rating" and varies from $1.67 per month, net, for the smallest farm consumers in some of the rural power districts to $8.35 for the heaviest class of consumers in other districts. For the typical farm the rate is, with some few exceptions, $2.50 per month.

The energy charge is a complicated three-block rate. For the typical small farm, the first block varies from 2½ cents, gross, to a maximum of 6 cents for the first 42 kwhrs per month. The second block varies from 1¼ to 2 cents for a number of kwhr which depends upon the price of the first block, being 258 kwhr where the price of the first block is less than 3 cents to 108 kwhr where the price of the first block is more than 5 cents. All consumption above this is charged at ¾ cent per kwhr, all with a 10 per cent prompt payment discount.

This is in sharp contrast with the rate structure of the TVA, whose rural rates are simple block rates. For the typical farmer using 100 kwhr per month the present charge is 3½ cents per kwhr, or only two-thirds of what the same man would pay in Ontario.

Average Use and Cost of Farm Service in Ontario

In the Hydro "Bulletin" of December, 1930, the Commission published for the first and only time the average use and revenues received from the various classes of rural service. These were as follows:

Class	Class of Service	Average Annual Use 1929	Average Annual Bill 1929	Average Net Price per Kwhr. 1929
2B	Small farm service	1,314	$53.48	4.1c.
3	Light farm service	1,102	66.67	6.1c.
4	Medium farm service	2,470	98.55	4.0c.
5	ditto (3 phase)	2,149	99.93	4.7c.
6A	Heavy farm service	8,330	239.90	2.9c.
6B	ditto (3 phase)	8,449	214.60	2.5c.
7A	Special farm service	15,590	395.98	2.5c.
7B	ditto (3 phase)	12,982	341.42	2.6c.

The Commission's reports do not show the number of customers in the various classes and an overall average for all farm use cannot be accurately determined. The 1931 Annual report, however, states that "Class 2B is the service usually supplied to small farms of 50 acres or less and Class 3 is the service usually supplied to ordinary farms of larger size. More than 90 per cent of new contracts for farm service are in one or the other of these two classes." Taking Class 3 (Light Farm Service) as typical of the majority of consumers, the following table has been prepared, showing the arithmetical averages of the rates computed from the published schedules of the 170 Rural Power Districts listed in the last annual report of the "Hydro" Commission and giving effect to the reduction to a maximum of 6 cents in the first step of the rate schedules.

System	Number Rural Power Districts	Quantity Used per Month, Kwhr 40	100	250	500
		Net Cost: Cents per Kwhr			
Niagara	88	9.9	5.0	2.8	1.75
Georgian Bay	42	11.2	5.6	2.9	1.8
Eastern Ontario	35	11.1	5.6	2.9	1.8
Total*	170	10.5	5.3	2.9	1.8

*Note: Including five districts in other systems.

It will be observed that, in spite of all subsidies, the price of electricity to the typical user on the average farm fails to substantiate the commonly accepted doctrine of low rates in Ontario. It is only when electric ranges or water heaters are used that the rates really become low. This is in line with the general results of Canadian rate making, as previously discussed by the author in earlier issues of the E.E.I. BULLETIN.* It once again emphasizes the manifest advantages of the low-cost water powers of Niagara and Quebec, in a region which has no coal deposits of its own and where supplies of natural gas are meager except in a few restricted localities. Except for these two appliances, whose popularity is primarily based upon the relative price and availability of competitive fuels and is an economic question which has little relation to government ownership, the use of the usual domestic appliances is smaller in Ontario than in the United States. This is emphasized by the following table which lists, in addition, the "saturation" of the principal farm appliances. Only one farm out of six has a watercloset and the meager number of other farm appliances in this, the most favorable of all regions, again emphasizes the practical obstacles which lie in the path of rural electrification.

* "Canada's High Domestic Consumption," E.E.I. BULLETIN, January, 1935.

PER CENT "SATURATION" OF DOMESTIC ELECTRIC APPLIANCES
DECEMBER 31, 1934

Appliance	Hydro Electric Power Commission of Ontario Urban	Hamlet	Farm	Total Hydro	Total U. S. A.
Electric range	26.1	10.8	19.8	25.0	5.0
Water heater	15.2	3.5	5.3	14.1	1.5
Washing machine	38.9	39.4	60.7	40.0	41.0
Vacuum cleaner	28.6	11.5	13.4	27.0	46.6
Refrigerator	10.9	8.3	7.9	10.7	28.0
Flatiron	93.6	68.6	82.3	91.8	98.0
Radio	60.7	58.3	65.4	60.8	79.7
* * * * * * * * * *					
Sanitary system	...	9.9	16.1	...	...
Water pump	...	1.5	15.6	...	...
Cream separator	...	...	7.0	...	...
Grain grinder	...	...	4.7	...	...
Milking machine	...	...	2.6	...	...
Incubator	...	...	1.0	...	...
Churn	...	...	0.9	...	...

Source: *Hydro Electric Power Commission of Ontario;* as shown in article entitled "Appliance Surveys—Urban and Rural" by G. J. Mickler, H.E.P.C. "Bulletin," November 1935, p. 355. *USA;* Edison Electric Institute, Stat. Bulletin 2, 1934, p. 14.

Argument on the Constitutionality of the Tennessee Valley Authority Act

Excerpts from Closing Argument in the Supreme Court of the United States on December 20, 1935—on Behalf of the Petitioners, Case of Ashwander vs. Tennessee Valley Authority

By James M. Beck

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Closing arguments in the Ashwander vs. Tennessee Valley Authority case were heard by the United States Supreme Court on December 19th and 20th. Messrs. Forney Johnston and James M. Beck represented the petitioners in the case, minority stockholders who question certain phases of the constitutionality of the T.V.A. Act of the Alabama Power Company, Mr. Johnston made an admirable presentation of the facts and findings in the case, while Mr. Beck's argument dealt principally with the broad constitutional questions involved. Stanley Reed, U. S. Solicitor General, and John Lord O'Brien, Special Counsel for the T.V.A., argued on behalf of the Government.

The case, began in 1934, was decided against the Government in the District Court of Alabama, by the late Judge William I. Grubb. The Circuit Court of Appeals in New Orleans reversed Judge Grubb's decision. Final action now rests with the Supreme Court.

THE one purpose of this suit is to prevent the transmission and distribution of electricity, not produced in aid of navigation, to the ultimate consumer, which is a departure from the process of improving the navigability of the river. It is a distinct thing.

First, as to the statute itself. This Tennessee Valley Authority statute shows on its face that its dominant purpose was to enable the Government to nationalize the sale of electricity in a large area comprising six States; that it was to be, as its proponents in Congress and in the executive department proclaimed it, a new departure of a socialistic character to enable the Government, with the facilities of the Tennessee River, to engage in the peddling of electricity to the ultimate consumer. The act shows that, not merely because it requires as a positive mandate that electricity shall be equally distributed among six States with their populations, but it contains an explicit statement and mandate that all must be done to produce the maximum output of electricity. . . .

The purpose of the Norris Dam was to increase the output of electricity. They had at the Wilson Dam far more electricity than they needed for the purposes of activating locks. It was shown that a little engine, a Diesel engine of 750 horsepower, would have been ample for the purpose of activating the locks. Norris Dam was not built for purposes of navigation. It has no locks. It was built avowedly to create a vast reservoir of water, which, added to the normal supply of water in Wilson Dam, and the lower dams, would result in the trebling of the output of electricity at Wilson Dam, and, as is shown in this case, when Norris Dam later on shall be completed, the additional water supply will give a supply of firm power three times that now available at Wilson Dam. To show that that was the purpose of the act, I venture to read a section where, in providing for the construction of Cove Creek Dam, now called the Norris Dam, it says that the power is given to the Tennessee Valley Authority to build transmission lines "including power house and hydro-electric installations and equipment for the generation of power, in order that the waters of said Clinch River may be impounded and stored above said dam for the purpose of increasing and regulating the flow of the Clinch River and the Tennessee River below"—

Now mark these words:

"So that the maximum amount of primary power may be developed at Dam Numbered 2—

The Wilson Dam—

"And at any and all other dams below the said Cove Creek Dam."

The maximum output of electric power at Wilson Dam before the completion of the Norris Dam is about 55,000 kilowatts. It will be over 200,000 when Norris Dam is completed. At all events, it will greatly increase the power.

With this mandate from Congress, not only to produce the maximum that could be generated at any one of these dams, all of which were to be interconnected by transmission lines, the act then provided that it should be distributed, as I have said, among six States in some equitable way.

At once the Authority was confronted with the fact, as the proponents of the legislation well knew, that there was no market for the power unless they destroyed the existing utilities. The existing utilities in that large area had 40 per cent of power in excess of any possible demand. Therefore it was a question, either of duplicating the transmission and distributing facilities of existing utility systems in order to force them out by the process of competitive destruction, or to buy them out under the threat of such potential and progressive destruction.

The Authority took the latter course, as their minutes show, and this Court will not understand this case until it reads the minutes of the Tennessee Valley Authority, the releases given out by them, the speeches made as a part of their propaganda in the Tennessee Valley. You will then see beyond peradventure that they promptly decided that they would first, under the threat of coercion, compel the four great power companies of Tennessee, Georgia, Alabama, and Mississippi, to sell out, and at a bargain price, because the Tennessee Valley Authority declined to allow anything for franchises or intangibles, or good will, but insisted upon these utility companies, which had been there for many years, and which were regulated by the States, and which had given satisfaction to their customers, being sold out at the mere price of bare bones of the

tangible assets. That is at 60 per cent, of replacement value for part and 52 per cent, of the value of certain land. . . .

What was in the contract so far as the Alabama Power Company is concerned? It has not yet been explained to this Court. It was not merely the sale of these transmission lines in some 14 or 15 little rural communities, with their customers, and with all the good will of that established business. That was only the first step. It was what the Tennessee Valley Authority was ready then to take over. But that very contract said this. It said to the Alabama Power Company, "We will give you, the Alabama Power Company, three months within which to sell your distribution systems to the urban communities, and if you do not in three months sell them, we will, with the PWA funds, erect duplicating facilities in the urban communities, and you will be ruined, inevitably ruined."

What is the Machiavellian feature of this matter? Who were to give these urban communities, which was the heart of the business of the Alabama Power Company, the money to erect duplicating plants? Was it the urban communities? Some of them were in the hands of receivers in the very court which passed upon this case, and all of them had exhausted their borrowing capacity. No! The PWA, in conjunction with the Tennessee Valley Authority, adopted a policy that they would give either to the rural or to the urban communities all the money they needed, on a no-recourse loan, a nominal loan. In other words, all the communities were not obligated to pay a penny back. All they were obligated to do was to turn over the distributing system to the Federal Government, and then if the Federal Government could, out of the distributing system, out of the consumers, ever get back the loan which the PWA would make, it was all right, and the Government was let out, and then the distributing system would be restored to the urban communities.

The Alabama Power Company had only two classes of property, apart from one little extension in one part of the State: It had its rural communities, and it had its urban communities. This contract provided for the immediate delivery of the transmission lines and the business of the rural communities, and it gave the Alabama Power Company three months to sell out the balance, namely, the lines and business of the urban communities, nominally to the urban communities but actually to the Authority.

Therefore the Alabama Power Company was threatened with absolute destruction. How had the Tennessee Valley Authority made it possible that all these communities would desert the company with which they had had satisfactory relations for years? They knew that in order to create a market for this vast amount of power which they were to generate to the maximum of production by the very mandate of the act, the only thing they could do was to enter upon a propaganda campaign, and thenceforth they issued releases and speeches, at chambers of commerce, Kiwanis clubs, and so forth, largely originating with the distinguished Director of the Tennessee Valley Authority in charge of this particular matter—Mr. Lilienthal. He was its most eloquent spokesman—and in some of his speeches there was a veritable hymn of hate against the utilities, in which they were called "pirates" and "freebooters,"—I am actually quoting—and in which every one of these communities was urged at once to take advantage of "the purse of Fortunatus" which Mr. Secretary Ickes had, and get the money without any liability to pay it back except by possible earnings in order to compel these companies. . . .

What were the preferred stockholders of the Alabama Power Company to do? They had no interest in the Georgia field or in Tennessee or Mississippi. They were faced with destruction. It is not a case of irreparable injury; it is a case of absolute destruction of their property, of their franchises; and all they could expect would be that the TVA, as a matter of grace, or by sufferance, would give them for the bare bones of their enterprise.

Let me add something most reluctantly, but with all deliberation, and I will take full responsibility for it.

If this Court will read this record, if you will see the ruthless manner in which the Tennessee Valley Authority tried to destroy the investments in these six States which aggregated $600,000,000, you will say—to use an expression of one Justice of the Court in another connection—that it presents a case of "administrative malevolence" beyond anything that was ever anticipated by any one. It is a humiliating chapter in our history, and the very proponents of it will one day recognize that that is the fact.

It is fortunate that this Court is able to determine this grave issue of constitutional power upon factual premises which are not seriously disputed. The District Judge, after an extended and most patient hearing, made 173 findings of fact which we submit fully justified his conclusion. Fortunately the Circuit Court of Appeals accepted the District Court's findings of fact, by saying that they "may safely be assumed to be correct since none of them is challenged."

In its brief summary of these findings of fact, there is the following statement which may well be the basic premise of my argument:

"It is not the purpose of TVA to limit the production of electric power to that needed by the Government in manufacturing war materials and providing for navigation, but its declared policy is to utilize to the fullest extent possible all the electric energy which the Wilson and other dams are capable of producing, by supplying first governmental needs and then by selling the surplus to users of electricity, in competition with public utility corporations engaged in the manufacture, transmission and distribution of electricity. In disposing of surplus power, TVA intends to obtain revenue, but at the same time to undersell its private competitors, in order to establish a power yardstick and to demonstrate the advantages of public over private ownership of electric light plants."

Such is the Appellate Court's own statement of the facts. Can the Federal Government manufacture a commercial commodity beyond its constitutional needs for the purpose of compelling private utilities to lower their rates or for the purpose of establishing a social theory of government ownership of an ordinary private business? Reasoning from that premise it is remarkable that the Circuit Court of Appeals could have reversed the conclusion of the District Judge to the contrary, for there is nothing in the history of this country or in the decisions of this Court or the text of the Constitution which gives any sanction to the theory that the Federal Government has any power to manufacture intentionally a commercial commodity, which it does not need for federal purposes and with which it seeks to destroy, not only private enterprise, but the powers of the State to regulate such private enterprises.

The Circuit Court of Appeals said:

"The Government by virtue of its lawful ownership of Wilson Dam owns also the water power inevitably created by the construction of that dam (cases cited). Congress, in the exercise of its power under Art. IV, Sec. 3, cl. 2, of the Constitution, to dispose of property belonging to the United States, may dispose of water power created at Wil-

son Dam as freely as it may of any other Government property."

Herein lies the real issue in this case. We challenge both these conclusions.

(1) The Government has no title to the waters. They belong to the State, in which they are located, subject only to the Government's right to use them for purposes of navigation.

(2) We deny that the Government, under the power to dispose of property can make any use of it, which is non-federal in character and, *a fortiori,* it cannot make any use of property in which it has only an easement.

The opinion contradicts itself by the admission "that the government of the United States cannot engage at will in private enterprise," for the necessary effect of its decision is the recognition of an absolute right to exercise powers, by the use of its property, even though they be in flat contradiction of the Ninth and Tenth Amendments to the Constitution. In holding that the Tennessee Valley Authority Act was constitutional, the Circuit Court of Appeals recognized in the Federal Government a power to create an anomalous governmental corporation, armed with letters of marque and reprisal to prey upon private industry and the reserved rights of the States, and merely camouflaged the privateer by the pretext that the physical source of the power, namely the dams, were an aid to navigation. If this Court should now give sanction to this doctrine, our dual form of government has sustained a fatal wound, for the property holdings of the Federal Government are so vast that if the right to use them for non-federal purposes is once conceded, it is difficult to see what right the Federal Government cannot exercise.

We admit the right of the Government to "dispose" of its property, but we deny that under such power of disposal it can make a continuing manufacturing use of its property for non-federal purposes. We also deny that the Federal Government has an absolute and unqualified title in navigable waters simply because it constructs a dam to improve their navigability. These belong, in each State through which they flow, to the States respectively, subject only to the power of the Federal Government in good faith to improve navigability. If the Government in damming a river creates an artificial pond or lake, the waters are still the property of the States, in which they are located, and the only power of the Federal Government, if it keeps faith with the solemn compact of the Constitution, is to use the waters to improve their navigability.

The theory that the Government has rights in respect to its property, which it does not enjoy without such property, is a pernicious constitutional heresy. Its possibilities may be illustrated by a single example. Today the Government has in its vaults over ten billions of unused gold. It is indubitably its property. If it be true that the mere ownership of property vests in the Federal Government the right to make any profitable use of it, however otherwise undelegated, then the Federal Government could invest the ten billions in any form of industry on the theory that it could thus make a profit for the benefit of the Treasury. This is, in its last analysis, an assertion of unlimited power.

In two pregnant words, the Constitution declared otherwise, for it begins "All legislative powers *herein granted* * * *." The very essence of our dual form of government is in the words "herein granted."

There were those in 1787, like Patrick Henry and George Mason, who doubted whether these words would prevent a complete centralization of power in the Federal Government—and today the times give portentous proof of their predictions—and because of these very fears, the Constitution was only ratified when there was given an assurance that two vital amendments should be added. The Tenth is too familiar for quotation, but the Ninth Amendment has especial application to the problem of this case. It says:

"The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people."

This solemn covenant may now be profitably remembered, for the mere right of the Government to "dispose" of its property, which must have a reasonable construction if our dual form of government is to exist, cannot be construed to deny or disparage to the States their right to regulate private business within their own borders.

Under the Tennessee Valley Act, the Government has sought to create a corporation which not merely usurps the reserved rights of at least six sovereign States, but for many indefinite purposes is seeking to create a new and anomalous State, for which no possible sanction can be found in the Constitution. It is interesting to note that this idea, that the Government could create a corporation with almost unlimited powers in its special field, was proposed in the Constitutional Convention, and formally rejected. On August 18th, Mr. Pinckney proposed that the Federal Government should have power "to grant charters of incorporation." The immediate objective of the proposal was to permit the Federal Government to construct canals and Mr. Madison suggested that the Federal Government should be empowered "to grant charters of incorporation where the interest of the United States might require and the legislative provisions of individual States may be incompetent." (Gaillard Hunt's Edition of Madison's Debates, Page 564.)

Colonel Mason of Virginia preferred to limit the power of incorporation to the construction of canals, and he expressed a fear that "monopolies of every sort, which he did not think were by any means already implied by the Constitution, would thus be made possible."

Even thus limited by amendment, the proposition was rejected by eight votes to three, and was never, thereafter, considered by the Convention.

The force of this conclusion is not weakened by the fact that in the territories of the United States, the Government may grant a charter of incorporation, but the fact remains that the Convention rejected any power to create a corporation as an agency of the Government for a non-federal purpose, for the proposal which they rejected did not refer only to interstate canals but to any canal, even though wholly intrastate.

The Tennessee Valley Authority Act is an obvious attempt to embarrass the judiciary by intermingling constitutional and unconstitutional powers in the hope that the former may save the latter. The learned counsel for the Government did not contend, if the Government had appropriated money to build steam plants for the generation of electricity with a view to supplying the needs of the consumers in the Tennessee Valley Basin, that such an attempt to go into State domain is excused.

The District Court found, and the Circuit Court of Appeals accepted that finding, that there was no physical or functional relation between the electricity project and the improvement of navigation. Indeed the Chairman of the Tennessee Valley Board himself admitted on the witness stand that this was a fact, and he testified that the only relation between the electric program and the improvement of navigation was

the economic one that the Government would thereby make profits, and thus pay the construction cost of the dam.

Much was said about the duty of the Federal Government to avoid the waste of power, of which the Tennessee River was capable, but little was thought by the proponents of this legislation of the waste of the Constitution. Indeed the proponents of this measure were less concerned with the waste of waters than with the destruction of the utility companies, for the avowed objective of the leading proponents of this legislation was that the project would demonstrate the superiority of public ownership of these utilities to private ownership. This objective would never be recognized by this or any Court, except upon the possible theory that to peddle electricity to the ultimate consumer had some physical or functional relation to the improvement of navigation. As stated, both courts below found to the contrary. I quote the finding of the District Court:

. "106. The Court finds that there is no physical or functional relation between the installation or non-installation of hydro-electric units (or the generation of energy thereat) in intentional excess of any capacity required for actuation of locks and dams and related purposes in or as a part of navigation dams and the regulation of navigation. The commercial sale of power in time of peace to industries or to the public not engaging or proposing to engage in some process relating to national defense or governmental use has no relation to and is not in furtherance of national defense or other governmental use or function as shown on this record."

This finding is not less true because of the instantaneous process of electricity. When the water flows down the sluices and operates the turbines, the navigability of the river is neither helped nor hurt. When the revolving dynamos generate electricity as a commercial product, it is a thing apart from navigation. It has nothing to do with navigation, except as the power may be incidentally used in the operation of the locks and other navigational facilities. The electricity thus generated cannot, in general, then be transmitted without a further manufacturing process. It must be transformed into a higher voltage to permit such transmission over the wires. When it reaches the point of consumption, it again must undergo a manufacturing process. The voltages must be reduced to be adaptable for the purposes of motive power or illumination. Then distribution is only made possible by the construction of overhead or underground wires that will carry it to the point of consumption, and there facilities must be provided to utilize the commodity.

Therefore the generation, transmission and distribution of electricity are distinct processes, and they have no physical or functional relation to navigation, except as the power, if the right to appropriate it were lawfully acquired, may be used to operate governmental facilities. To dispose of a surplus of electricity at the bus bar can be justified under the property clause of the Constitution only when the Government owns the dam, owns the water rights and combines them in the manufacture of electricity for a bona fide governmental purpose, which is disclaimed by the Government; but even if it were otherwise to engage in the business of transmitting, transforming and distributing the electricity to the ultimate consumer is a distinct business, and has no necessary or natural relation to the power over navigation. The attempt to confuse the operation of dams and locks, or other navigation projects, with the business of selling electric power or light to the consumer cannot stand analysis, for the lower courts found they are separate activities. The one is on one side of the line that divides federal from state power, and the other is clearly on the other.

Edmund Burke somewhere said that while it was impossible to mark a precise line between night and day, yet night and day, for practical purposes, were clearly distinguishable. This happy analogy can be applied to our dual form of government. It may be difficult at times to draw a precise line, which will indicate where federal power ends and where state power exists, but when this Court considers a concrete case as a practical reality, it finds no difficulty in saying on which side of the line it is.

If we apply this happy illustration of Edmund Burke to the problem now under consideration, common sense makes possible an easy and satisfactory solution. For example, we know that the Government has the right to construct a navigation dam on the Tennessee River in aid of navigation. While the waters of the Tennessee remain the property of Tennessee, yet as the dam plainly belongs to the Government, it can lease the implacement, as was done in the Boulder Dam compact.

We cross the dividing line when this water power is used by the Government to generate electricity, for electricity is not water. It may be invisible to the human eye, but it is nevertheless a commodity of commerce. When electricity is thus generated it is lawfully created according as it is generated for a purpose having a positive relation to a governmental function.

When the Government intentionally produces a large surplus of electricity, not in aid of navigation but for the purpose of distributing it and retailing it to the consumer, then the Court can say that generating, transmitting and distributing electricity have no physical or functional relation to navigation, but is the indefinite commitment of the Federal Government to a distinctly new business, which has no sanction in any grant of power under the Constitution. To recur to Burke's metaphor, we know night as a practical thing, and we know that the utility business is a function of private enterprise, subject to the regulation of the State and not of the Federal Government.

This extraordinary departure from the policies of this Government, from its very beginning, was not enacted by Congress under the accepted belief that it was within its constitutional powers. On the contrary, from the time that Muscle Shoals was first considered in 1916, the question whether the Government could, under the guise of its war power, enter upon the business of manufacturing and selling fertilizers and electric power, was the subject of heated and continuous controversy in that and succeeding Congresses. Time and again Congress refused to pass the measure in the belief that it was beyond its constitutional powers, and two Presidents, for the same reason, vetoed it.

Many Senators of great distinction clearly pointed out all that we are trying inadequately to say today. As the distinguished Floor Leader of the Democratic Party in the House of Representatives, Mr. Garrett of Tennessee said on May 9, 1928:

"Mr. Chairman, for the first time in all the history of the country, it is deliberately proposed that the Federal Government shall go into business for business' sake. There is no use in our deceiving ourselves concerning this matter. This Bill is not to promote navigation. No one would ever have dreamed of it as a navigation proposition. This Bill is deliberately designed to put the Federal Government into two avenues of business, namely the manufacture of fertilizer and the development and sale of electric power, and in order to do it the Committee on Military Affairs has deliberately determined to take from the State, in which the greatest water power possibilities exist, the control over the water powers that are on

the particular stream that this Cove Creek Dam will affect."

It is interesting to note that the chief proponent in Congress of this measure, Senator Norris of Nebraska, recognized that his particular project went beyond the true functions of the Federal Government. He did so when he was discussing the clause which offered to two States, through which the Tennessee River flows, 5% of the gross proceeds as a sop for their lost taxing power. On more than one occasion he said:

"We are going beyond a governmental function and yet the power derived comes from the performance of a governmental function."

Again he said:

"But where we go further than that, go beyond the governmental function, as we either must do or let (the water) go to waste, which would be sinful, then I think we are trenching upon the taxation rights of the States, and I do not want the Government to do that."

His remedy for usurping the taxing power of the State was to give them, in lieu thereof, 5% of the gross receipts, and thus he invited the States concerned to sell their birthright for a mess of pottage.

How long the Federal Government, after this usurpation, would continue to silence the States by a legislative bribe, we do not know. This project is of indefinite duration, and its socialistic characteristics are emphasized by the fact that it avowedly begins with a "five-year plan," similar to that of Moscow. It contemplates the expenditure by the taxpayers of the United States of 283 millions of dollars. This five-year program, so called, will be found on Page 419 of the record, and by it will appear that after allotting 197 millions for dam and power house construction, 43 millions are allotted to buy a market for the power thus created, and 24 millions are given to the "general program," which quite obviously means the program of civic betterment, by relocating towns and villages, and even, as Professor Tugwell proudly asserted, the right to "depopulate cities." Stalin could regard this as a recognition of Russian methods of greater value than the mere diplomatic recognition of Russia by our State Department.

The history of the legislation, the statements of its chief promoters, Senator Norris of Nebraska and the President, together with the oft-repeated formal statements of the three administrators, charged with the responsibility of carrying into effect this extensive project, all clearly show that even though the Tennessee Valley Authority was authorized to make some improvements of the Tennessee River in the interests of navigation, yet the primary and dominant purpose of this Act was to commit irrevocably and for an indefinite future the United States Government to the business of generating, transmitting and distributing electric power over a vast area, which comprises many States, with an aggregate population of twenty-four millions of people.

Constitutional and unconstitutional powers have been intermingled in the Tennessee Valley Authority Act, but in view of the oft-repeated assertions of governmental officials, from the highest to the lowest, with which this record fairly reeks, and in view of the very language of the Act, it cannot be disputed that the purpose of the Government was to enter upon the vast experiment of permanent duration of generating, transmitting and distributing electric power as a new function of the Federal Government. I say a new function, for it is an argument in our favor that the Constitution had existed for over 140 years before anyone had the hardihood to suggest that it authorized the Government to engage in the utility business.

I recognize that among the delegated powers was the power to "dispose" of property belonging to the Government, and if time permits I shall discuss that later. I content myself now with merely stating that the power to dispose of property does not mean an unlimited power to use property for manufacturing purposes. When it was first proposed to utilize the abandoned Muscle Shoals plant for the manufacture of fertilizers and electric power, the distinction between disposing of the property and using it for the purpose of carrying on a private business was clearly indicated on the floor of the Senate by one who is now a member of this Court. Mr. Justice Sutherland will, I know, acquit me of any intention to make a record of any statement that he made as a distinguished member of the Senate as if it were now binding upon him. I mention it only because he so aptly pointed out the distinction between disposing of property and putting it to a profitable use in a non-federal business.

When the construction of the Muscle Shoals plant for war purposes and in anticipation of war was under discussion in the Senate, Senator Jones of Washington proposed a provision to authorize the Secretary of War to dispose of any surplus electric power which might be generated at these projected plants. In the course of a running debate, Senator Sutherland thus made a distinction between the power of the Government to dispose of a surplus stock of goods and the power to enter upon the continuous manufacture and sale of a surplus which had been intentionally created for the very purpose of engaging in the business. Senator Sutherland then asked Senator Jones this very pertinent question:

"Does the Senator think that the Government of the United States could appropriate money to build a factory for the purpose of manufacturing clothing for its army, and then upon occasions when the operation of the factory was not necessary to produce clothing for the army, that it might go into the manufacture of other clothing to be sold in the market in competition with the dry goods merchants of the country?"

Senator Jones could see no distinction, to which Senator Sutherland replied that "the two things are utterly different." Fortifying his reasoning, Senator Sutherland said:

"I think we can sell anything that we have on hand and have no use for, but I think that is a very different thing from a case where we find ourselves unable to carry on the manufacturing enterprise that we are authorized to do and divert it into carrying on an essentially private business in competition with our own citizens * * * This bill contemplates from the beginning as its principal purpose that the surplus shall exist. It is not expected, it is not suggested, that this surplus shall arise fortuitously hereafter, accidentally hereafter, but it is contemplated in the bill itself that the government shall manufacture the surplus."

This is as true of the Tennessee Valley Authority Act as it was true of the original plan under discussion. Indeed the purpose to create intentionally a surplus of electricity far beyond the necessities of navigation was emphasized by the Act itself. It is the main purpose of the Act. It authorizes the TVA "to sell the surplus power not used in its operations and for operation of locks and other works generated by it, to States, counties, municipalities, corporations, partnerships or individuals according to the policies hereinafter set forth." It then authorizes the Board to enter into contracts for the sale of power for periods of twenty and thirty years according to circumstances. It thus obligates the Government through its subsidiaries to manufacture enough electricity to make an equitable distribution between all the States, counties, municipalities, corporations, partnerships, or individuals in the

whole Tennessee Valley Basin, and this obviously required a generation of electricity far beyond the necessity of navigation. Indeed it is admitted that when the Norris Dam is completed, the TVA will have up to sixty times more electrical power than it needs for any known governmental purpose and the Chairman of the TVA Board, Mr. Morgan, admitted that there was no physical or functional relation between the generation of this vast amount of electricity and the facilities for improving the navigability of the Tennessee, except the economic one that by the profitable sale of electricity the Government would recoup the expense of the venture.

Moreover the mandatory construction of the Cove Creek Dam leaves no doubt whatever. That Dam was intended to create an indefinite surplus of electric power for resale. It is gravely to be doubted on the face of the Act and upon this record if the Cove Creek Dam can be said to have been constructed to serve the purposes of navigation. If it were it would have had locks and no locks were provided. Even for the purposes of flood control, the declared purposes of Cove Creek Dam, as stated in the Act, were inconsistent with flood control, for the Act expressly provided that the Cove Creek Dam should be constructed with the necessary transmission lines to the Muscle Shoals,

"including power house and hydro-electric installation and equipment for the generation of power, in order that the waters of the said Clinch River may be impounded and stored above said dam for the purpose of increasing and regulating the flow of the Clinch River and the Tennessee River below so that the maximum amount of primary power may be developed at Dam No. 2 (the Wilson Dam) and at any and all other dams below the said Cove Creek Dam."

Had the Cove Creek Dam been constructed for the prevention of floods, it could only serve its purpose if its waters in dry seasons should be kept low to permit of the impounding of waters in the occasional flood periods, whereas the objective of creating the maximum amount of primary power to equalize low water periods in the Wilson Dam necessarily meant that the dam should be kept full at all seasons.

Nor can there be any question as to the purposes of this intentional generation of surplus electricity far beyond the necessities of navigation. Nothing could be more frank than the purposes of the proponents of this revolutionary legislation. The purpose was primarily to give cheap electricity to the residents of the Tennessee Valley Basin at the expense of the taxpayers of the United States. The second was to furnish a yardstick in order to demonstrate that private utilities were charging too much for electric power. The third was to demonstrate the superior advantages of public ownership of this form of utility, as compared with private management. These objectives were never concealed and do not admit of dispute. They originated with Senator Norris of Nebraska, and with him it has been an obsession to destroy what he calls "the Power Trust," which is as mythical as Dickens' Mrs. Harris.

The debates in Congress, in the long controversy over this project (for it was vetoed by two Presidents and rejected by more than two Congresses), indicate that this project finally triumphed because its proponents in Congress were influenced by the opportunity to furnish some millions of people with cheap electricity and cheap fertilizer, at the expense of American taxpayers, and also because judgment yielded to emotion when Congress was swept by a veritable "hymn of hate" against the private utilities, a few of which had unfortunately given some justification to public distrust.

The plan to use the abandoned Muscle Shoals plant as a socialistic experiment modestly began with the mere manufacture and sale to farmers of fertilizers, but to the chief proponent of this socialistic scheme (Senator Norris of Nebraska), a new vision came, in the language of Keats,

"As when some watcher in the skies
When a new planet swims into his ken."

A new planet should be created in the constellation of the States—a virtually new State in a large and important field of power, comprising six former States, in which socialistic ideas could be put into successful operation.

Thus moved by the inspiring vision of a new economic order, it is not surprising to find that the most dithyrambic orator of the New Deal should have added the weight of his eloquent approval. Witness these words of Professor Tugwell of the Department of Agriculture in reference to the President's Tennessee Valley project:

"This work of his carries more significance for the future than any other single attempt of the administration to make life better for all of us. It is in no sense emergency as so many other actions have necessarily been. It did not have to be done to stave off financial panic, to avert war, or to relieve distress. It is a deliberate turning toward the future, a commitment to an ideal. Its success can depopulate cities, destroy a thousand entrenched privileges, invalidate a whole tradition of single-hearted self-interest."

Professor Tugwell might have been more specific. The tradition which his "ideal" would destroy is the Constitution of the United States.

Of similar import are the unnumbered speeches of Mr. Morgan, the Chairman of the Board, of Mr. Lilienthal, its zealous Director, and general counsel, and of other high officials, all of whom have apparently forgotten that the power of the Federal Government over the Tennessee River was limited to the question of its navigability, and all of whom saw the vision of a new America, in which the Federal Government should, in the Tennessee Valley Basin and in other similar projects throughout the country, take over the vast business of generating and distributing electricity, even though its inevitable effect would be to destroy the investments of private utilities which exceed in value twelve billions of dollars. It is disingenuous for the counsel of the Government to soft-pedal these utterances. They are not random and irresponsible talk of journalists or publicists but the avowed statements of policy of men "drest in a little brief authority" to create this *imperium in imperio*.

The matter would be too clear for argument if the proponents of this socialistic measure had not intermingled an unconstitutional project with the undoubted power of the Federal Government to improve the navigation of the Tennessee River, and this can be easily demonstrated by a supposititious illustration. Suppose that the coming Congress would pass a law vesting in three men, or one man, the power to take over the entire Mississippi River with all its tributaries, navigable and unnavigable, for the specific purpose of generating electric power for sale to all users of electricity in the Mississippi Valley within transmission distance. Would any one question that such a law would be clearly unconstitutional? How can it be more constitutional when the same power is intermingled with the purpose of improving navigation, unless there is some natural and reasonable relation between the sale of the electricity to the ultimate consumer and the facilities of navigation?

The issue admits of a very simple

test. Suppose that Congress had said nothing about the improvement of the navigability of the Tennessee River, but had passed a statute which provided that the Tennessee Valley Authority could erect steam plants for the generation of electricity to be transmitted by the Government and sold to the ultimate consumer. Would this Court question for a moment that no such power had been granted by the Constitution? How does the principle differ if such an ambitious project is coupled with a simultaneous improvement to the Tennessee River? Undoubtedly Congress can pass any measure in its discretion to improve such navigability, but can it arm the Federal Government with letters of marque and reprisal, camouflaged by the pretext of incidentally improving the navigability of the river, and thus gain a power which it would not have under other circumstances? If this be not so, then the Constitution is little more than a "scrap of paper," for in undertaking any legitimate operation to improve the navigability of the river, it can superadd a vast program for an industrial enterprise, to which authority has been denied to the Federal Government, both by the Ninth and Tenth Amendments, and by the whole text and spirit of the Constitution. . . .

After vindicating the doctrine of implied powers, when based upon necessary implications, and carefully qualifying such doctrine by stating that "the end must be legitimate" and "within the scope of the Constitution" and "plainly adapted to that end," and must "consist with the letter and spirit of the Constitution," the great Chief Justice (Chief Justice Marshall, in *McCulloch* v. *Maryland*, [4 Wheaton]) proceeded to give both a warning and a challenge in the following familiar words:

"Should Congress, under the pretext of executing its powers, pass laws for the accomplishment of objects not entrusted to the Government, it would become the painful duty of this tribunal, should a case requiring such a decision come before it, to say that such an Act was not the law of the land."

This solemn warning was re-affirmed by this Court a century later in *Linder* v. *The United States*, 268 U. S. 5. . . .

I need not suggest the applicability of these solemn pronouncements of this Court. They are more necessary today than they ever were, not only because the centripetal tendencies of a mechanical civilization have made the perversion of federal powers more frequent and destructive, but also because the diminished consciousness of the states and the ever greater reliance of their citizens upon a would-be omnipotent central government make more easy the destruction of states rights through a perversion of the federal powers. "The appeal to the people" of which the Supreme Court has at times spoken, as the final refuge, is now largely ineffective, and unless this Court, as the final conscience of the American people in matters of constitutional morality, defends the Constitution, its destruction by the perversion of federal powers will steadily progress. . . .

Should this Court sustain this law, no one can question the grave implications of that decision. It would be sufficient for many purposes to convert a constitutional federation of the States into a unitary socialistic state of unlimited powers.

In all parts of this vast continent, there are many navigable streams, and unless this Court forbids the Federal Government from carrying out its present avowed policy "to electrify America" Congress can pass laws to construct dams on a thousand rivers under the pretext of improving their navigability, and then proceed to generate the maximum of electrical power to furnish electricity to the consumers and thus supplant all existing electric utilities, whose aggregate value today is twelve billion dollars.

I recognize that this is purely a question of constitutional power and that this Court may not consider economic consequences, but I say with confidence that such a power was never dreamed of, even by the ultra-Federalists in the Constitutional Convention. Alexander Hamilton's project for a United States Bank seemed to them the extreme assertion of federal power, but Hamilton would today rub his eyes in amazement if he contemplated the possibility of so construing the Constitution as to permit the Government to enter upon the general manufacture of commercial commodities and their sale to the people.

Recently I read Swift's immortal satire of Gulliver among the Lilliputians, and a curious interpretation of its political significance occurred to me.

Swift's Gulliver is mankind, by which I mean not merely the sum total of living human beings, but mankind as an historic entity. To this Colossus of the past and present, the individuals of a living generation are ephemeral.

Mankind, as Gulliver, is truly a giant, "bestriding this narrow world like a Colossus," and we living beings can only judge of his stature by his achievements, which are far more the work of the past than of the present.

Of all the institutions of this Gulliver, one of the greatest is the Constitution of the United States. It was not merely the work of its framers, even though they may have had a greater stature than many of their generation, but was the synthesis of the political aspirations and experience of uncounted generations. Its framers had studied the lessons of the past and had reached the conclusion that a league of States, whose central government had no real power, would inevitably disintegrate, but on the other hand they equally believed that if the central government had all power, the constituent States would inevitably be absorbed, and that no central government could ever lastingly govern America, if its powers were unlimited. Therefore they sought to limit the powers of the Federal Government to a strictly defined channel of power, and they believed that if this line of demarcation between the central government and local self-government were not observed, the Union would sooner or later disintegrate.

It is this consideration that gives to the case at bar its great importance. If the Federal Government can invade, in the large field of electricity, six sovereign States, usurping their reserved powers in respect to a basic industry and substituting federal officials for local officials, and federal laws for state laws, it can do so with a greater number of States and in respect to industries that are even more important.

To preserve this line of demarcation that is so vital to the perpetuity of the Union is the august function of this great tribunal. Let it beware of such an entering wedge as the approval of this unprecedented socialistic scheme would be. I have quoted the solemn warning of Chief Justice Marshall. Let me supplement it by an equally ominous warning of Chief Justice Fuller, when he said in the *Lottery Case*,

"Our form of government may remain notwithstanding legislation or decision, but, as long ago observed, it is with governments as with religions, the form may survive the substance of the faith."

The Utility Problem

By Wendell L. Willkie
President, The Commonwealth & Southern Corporation

An address before The Bond Club of New York, December 19th, 1935

FOR a great many years this country has had a utility problem. It has occupied column upon column in the newspapers, commanded hour after hour of the attention of congressional committees, and usurped for weeks without end the debates in the nation's legislative halls. Now it is in the courts.

Many people have been wondering what this utility problem is all about, and why it has not been settled. Perhaps it would have been disposed of long ago had there been unanimity of opinion as to the issues involved. Measured in terms of the average family budget, it is not a question of extraordinary importance, and judged by the readiness with which it might be solved, once it has been divested of its political aspects and the full facts are clearly understood by the public, it is neither profound nor are the prospects of an ultimate solution discouraging.

What is all this fight about? The average tax on a package of cigarettes is six cents. Supposing the members of a family consumed a pack and a half of cigarettes a day, the tax this family would pay to the government would be $32.82 a year. The average annual electric utility bill paid by the American family is only $33.72. No plan that I have yet seen fostered by the most rabid opponent of the privately owned utility industry, outside of that of having the government generate electricity and give it away, has promised to reduce this annual family expenditure of $33.72 by more than a few dollars.

Now I recognize the necessity as well as anyone of saving every possible dollar for the family budget and I am glad to say that the electric utility industry has had one of the most splendid records in American business in that direction. Year in and year out its rates have been reduced, yet the political clamorer who has remained strangely silent on the family's outlay for cigarette taxes, which is only an incidental in our back-breaking tax burden, has focused his full attention on the household expenditure for electric energy.

MR. WILLKIE

Nevertheless there is a utility problem, and it is of the most pressing character. The problem is, how can this great industry, perhaps the second largest in the nation, be relieved of its lethargy and be put to immediate work, representing as it does, an investment of twelve billion dollars and capable of doing more than almost any other industry toward liberating the forces of business recovery, restoring employment, creating a wholesome and stimulating demand for durable goods and finally ending this depression.

Why has this great industry been lashed to the barrier when everyone has been trying to whip forward the forces of revived trade and restored prosperity? How can it be unleashed for its constructive service to American commerce and industry? Those are questions which I wish to discuss with you today.

First, it is necessary to review some recent history. The electric power companies have had to withstand during the last year one of the most severe attacks ever launched against any industry by government. I assume that those who conducted this attack were sincere in their belief that they responded to popular desires and served the public welfare, and while I am wholly at variance with their view, I must commend the zeal with which they strove toward their objective.

It was apparent when the present administration took office that it was intent upon public utility reformation. Any fair-minded person must have recognized that there were certain evils which needed correction. Party platforms had declared for a reasonable program of utility regulation. Destruction was never surmised or suggested. It is unnecessary to speculate on how the different phases of the Administration's public utility program were developed, for we are here merely reviewing the progress of this extraordinary course of action. I want, as dispassionately as one can who has been under its harrow, to describe briefly to you the sequence of this attack.

The first step in this utility program was the Tennessee Valley Authority. In June, 1933, the Administration secured the passage of an Act, which created the Tennessee Valley Authority and transferred to the directors of that Authority, the Federal Government's investment of $125,000,000 in the steam and hydro plants and other facilities at Muscle Shoals, Alabama. The Act appropriated an additional $50,000,000 of Federal money for the further extension of this electric power project, an appropriation which was subsequently followed by other appropriations, in the advocacy of which it was suggested that the cost to the tax payers of the country would ultimately approximate one billion dollars. Ninety-five per cent of the taxes which must pay for this staggering outlay comes from States outside the Tennessee Valley, a fact which has given rise to the very pertinent remark that the Tennessee River touches five States and drains the nation.

Whatever else may be said about the

mysteries of the Tennessee Valley Authority, it has shown the country how the citizens in many far-flung sections may be induced to help pay the electric light bills of the residents of Tupelo, Miss.

After the passage of the Tennessee Valley Authority Act, Federal power projects even more extensive than the Tennessee Valley Authority were authorized at Grand Coulee, Bonneville and projected at Passamaquoddy and other points.

During the course of the creation of these unprecedented Federal undertakings, it was announced that the Federal Government would give 30 per cent, later raised to 45 per cent, of the cost of construction and loan the balance at low interest rates to any municipality desiring to duplicate the distribution system of any electric utility company.

While all of these projects were getting under way, Commissioner Humphries was removed from the Federal Trade Commission, because his mind did not go along with the Administration, a removal which the Supreme Court, incidentally, held to be illegal. The Commission, thus purified, began a series of some hundreds of publicity handouts assailing the public utility industry in what could scarcely be called temperate terms, drawing generalized conclusions from isolated instances of mismanagement and casting many unfair imputations at reliable and responsible business organizations.

It became apparent to all that the country, the utilities, their consumers and security holders were about to suffer irreparable damage if something were not done to bring about an accord and understanding between the industry and the government.

In December, 1934 prior to the introduction of the Public Utility Act of 1935, the so-called Wheeler-Rayburn Bill and because our particular interests were so vitally affected by the Tennessee Valley Authority program and the continued attack upon holding companies, I made an earnest endeavor to work out with responsible Federal agencies a procedure for the solution of the utility question.

This solution in my judgment would have met, to the fullest extent, the objectives of the Administration and still would have permitted the utilities to continue their development and play their part in bringing about economic recovery.

This proposed compromise contained the following points:

1. That in the territory of any utility company which had a base rate schedule and supplemented such with an objective rate, all satisfactory to the Federal Government, the Federal Government would not build duplicate transmission or distribution systems or give and loan money to cities to do so;

2. That utility companies as a group were to spend for capital construction, in anticipation, if necessary, of future needs, a minimum in the years 1935 and 1936, of twice their then anticipated requirement;

3. That the Federal Government should complete the hydro electric dams which were in course of construction, where necessary to prevent economic waste; that the utility companies operating within transmission distance of such hydro electric plants were to buy and absorb into their systems as rapidly as possible, all energy generated by such plants; that until the absorption of the output of such plants they would not build additional generating plants of their own; that they would pass on to the ultimate consumer the entire saving between the price which the government would charge such companies for such energy and the cost to such companies of generating their own power—thus giving to the ultimate consumer the full benefit of any subsidy that the government desired to make in connection with such hydro developments;

4. That the utilities would spend a substantial amount of money on rural lines whether the same were profitable or not;

5. That there should be created a national commission composed of a representative of the President's cabinet, representatives of the leading manufacturers of appliances and the utilities, and one or two outstanding citizens representing the public which would constitute a national electric commission for the electrification of America;

6. That arrangements would be made with manufacturers of electrical appliances on a large scale basis so that a minimum standard model of appliances such as ranges, refrigerators, etc. could be established and a minimum price thus obtained; that such appliances should be sold on long terms and arrangements should be made with the Federal Reserve System or the Reconstruction Finance Corporation for the large scale rediscount of such paper through the commercial banks;

7. That a utility holding company regulatory bill should be enacted which would eliminate and prohibit all of the alleged abuses existent in that field of endeavor, establishing a strict but fair regulation over the operations of such companies.

Let us examine the details of this plan and we can perhaps get some impression of what this utility battle has cost the American taxpayer and the American public.

It was estimated at the time of this compromise proposal, and not denied by representatives of the government, that the adoption of the plan would have created in the first year of its existence a minimum of three and a half billions of dollars in business, that it would have put into use a substantial percentage of the excess funds in the banks of the country. All of this with the multiple effects of the expenditure of money in basic industry and the use of credit, would have expanded many times in its ultimate effect upon business.

This compromise likewise would have meant tremendous benefits to the public in the use of electric energy. If the objective rate had been accepted both by the government and by the utilities of the country, the domestic consumers of electric energy in the United States would have used an additional two billion kilowatt hours and at no increased cost to them. The objective rate was developed by the rate engineers of The Commonwealth & Southern Corporation and the above calculation is based on the experience of actual use of this form of rate in several of our operating companies.

I might explain that the objective rate plan involves the use of two rates effective coincidentally, the objective rate being materially lower than the other, thereby offering to the customer increased kilowatt hours at no additional cost. This results in a rapid increase in the use of electric energy thereby resulting in a lower average rate on the customer's entire consumption of electric energy. This increase in consumption necessitates a requirement for new distribution facilities and new generating plants. This calls for durable goods and stimulates employment in the durable goods industry. Likewise, additional electric appliances are purchased by the householder in order to utilize this additional consumption. Added electric appliances necessitates more people to manufacture, sell, and install them. Such was the opportunity at the time this compromise was presented to the government at the close of 1934.

Representatives of a substantial portion of the utility industry met with governmental representatives concerning the plan.

After numerous conferences with governmental officials, all of whom appeared to be greatly interested, the plan was taken for presentation to those in final authority. It was then that we first heard of the "death sentence." It was then that the melancholy word was spoken that the utility holding companies were to be outlawed and exterminated; that the utility operating companies were to be placed under regulation so stringent

and rigorous that the prerogatives of management would repose thereafter in a Federal bureaucracy, with private initiative virtually abolished from this highly important, efficiently conducted American industry.

Since we were American citizens, we did not know how to die by executive decree. We believed that we were living under a Constitution which gave us the right to protect the property of the persons for whom we were trustees. We fought the death sentence. We fought as best we might against overwhelming odds and against the full impact of the National Administration with its four billion, eight hundred eighty millions of dollars of relief funds and the overwhelming effect of its control of Federal patronage. After a prolonged fight, the bill passed the Senate by one vote and was twice defeated in the House. Then in the closing days of the session, under the pressure of a Senatorial investigation bringing out dramatic and isolated instances of errors of some utility companies but never calling attention to the intensive and extensive lobbying of governmental agencies, and in an atmosphere of hysteria in which the Speaker of the House declared that he could not discuss this bill because he had not read it but wanted the members of Congress to vote for it because it was the Administration's desire, the bill finally became law.

Since that date a great portion of the staff of utility companies have devoted their time to the gathering of information for governmental investigating bodies through further diverting them from their ordinary activities in the promotion and sale of electric energy. It has been widely publicized to the world that millions of dollars were spent by the utilities in opposing this legislation. I do not know what other companies spent but every dollar spent by The Commonwealth & Southern Corporation, was spent in an entirely legitimate pursuit of studying and presenting to the public and to those in public life, information on the consequences of this bill. As far as I am personally concerned in my duty as trustee to 200,000 utility security holders, I have only one possible regret, if by spending more money legitimately the Commonwealth & Southern could have prevented this destructive Act from being passed, that I did not authorize such additional expenditure.

No mention has been made in this lobby inquiry that from March, 1933, until the time of the introduction of this bill hundreds of releases were issued by the Federal Trade Commission, all critical and many defamatory of the industry, which were carried in almost every newspaper in the United States, as the newspapers had a perfect right to do, because the releases were from an established and presumably responsible Federal bureau. The TVA during this same period was issuing numerous releases extolling the virtues of public operation and discrediting the operations of the private companies, while likewise members of other Federal authorities were issuing releases of a like character and making fault-finding speeches about the utilities, and overtopping it all, the President of the United States himself was issuing releases and making speeches concerning the power industry.

Let us assume that the charge that the utilities spent five million dollars in their fight against this bill, is correct. The facts I do not know. I say, however, that the newspaper space devoted to these releases of governmental authorities arraigning the utilities, if paid for as advertising material, would have been ten times the sum spent by the utilities in seeking to preserve their business. In addition, this publicity coming from Federal Agencies and from Washington at a time when there was great distress in this country, made the front pages of the newspapers which paid space advertising could not have bought.

One of the surprising elements of the anti-utility campaign was that it was conducted in the face of the fact that the rates of the operating units of holding companies operating diversified properties against which the death sentence was primarily directed are in almost all instances lower than the rates of operating companies unassociated with holding company groups.

Let us take for example, the two types of diversified utility holding companies. The Commonwealth & Southern Corporation owns utility operating companies in eleven States. Its power systems are in middle sized cities, towns and rural areas. We have in our entire system only two cities of over 250,000 population and only seven cities of over 100,000 population. The average population per community served is only 1851. In the eleven States in which we operate our rates for domestic consumption are lower in each State than the rates of the so-called independent companies operating in such States. They are likewise lower in each State, taking into account taxes, than the rates of municipally operated systems in such States with the exception of the section of Mississippi where the heavily subsidized TVA rates are applicable. The average domestic rates in this country for the year 1935 are approximately 5.04c. per kilowatt hour, while the average domestic rate in our system is 3.98c. per kilowatt hour. In other words, our domestic electric rates are 20 per cent below the national average, although we operate in a territory of low customer density.

Another type of holding company with diversified properties, is the North American Company. It differs in that its operating units are located in large cities. A recent Federal survey shows the rates charged for domestic electric energy in all cities of 50,000 or more population. In this group the North American Company serves nine cities and the so-called independent companies, or operating companies not affiliated with holding companies, serve twenty-eight. Yet the rates of the North American Company units are 18 per cent lower than those of the group where the operating companies are unassociated with holding companies.

Things of this nature do not happen by accident. As was said centuries ago "By their fruits ye shall know them." When a diversified utility holding company system is able to give the public efficient service at lower rates, common justice alone decrees that it should be commended. Certainly it should not be placed in the category of organizations so inimical to the public interests that it should be excoriated among American business institutions.

Why are utility holding companies able to present this kind of a record? I can answer for The Commonwealth & Southern Corporation:

First—It provides centralized engineering, financial, new business, operating, accounting, purchasing and other similar services and supervision at absolute cost and without one cent of profit to the holding company and at a cost much below that for which these operating companies could separately obtain such services;

Two—It provides a reservoir of capital from which the operating companies have been able to draw their requirements of capital when money rates were high, and secure for such operating com-

panies refinancing of the same when money rates were low;

Three—It has provided for the operating company a constant flow of equity money; more than ninety-six million in the last four years, thus creating a constantly increasing cushion which has permitted the sale of low interest bearing bonds and preferred stocks;

Four—It has received on its common stock or equity investment a much lower rate of return than is demanded by the common stockholders of operating companies where such stock is widely held by the public;

Five—It has provided for the operating companies continuity of management;

Six—With the recognition of the age old principal of diversity of investment it has been able to give to its operating units a financial stability which they could not otherwise have obtained.

If you do not believe what I say about it, let me read you what President Roosevelt thought about the small independent slant as he expressed it in a letter addressed Nov. 5, 1926, at Warm Springs, Georgia, to Mr. Thomas W. Martin:

"We, in this and the neighboring communities, are suffering from the usual high cost and inefficient service of small local power plants * * *"

Also let me read you what David Lilienthal, one of the TVA directors said when he was public utility commissioner and before he became a competitor of ours operating his own holding company at public expense:

"Since the pioneer public utility acts of New York and Wisconsin were enacted two decades ago a new figure, the holding and management company, has come upon the field, demonstrated its prowess, and in a relatively few years changed the entire economic nature of the public utility industry. Isolated plants have given way to great systems whose lines span several states and serve hundreds of communities, all operated under unified managerial and financial supervision. The spread of rural electrification, the amazing advances in telephony, the rise of superpower systems—these and many other technological developments so intimately related to the public welfare are directly attributable to the efforts of the holding company. Perhaps most important of all, to the holding company must go the credit for the unprecedented flow of capital into the public utility industry making possible extensions and improvements of service. Every phase of public utility operation—financing, accounting, engineering, management, public relations—have undergone great changes under the new regime."

Also let me quote to you from another very critical student of the industry and of the utility holding company, Dr. Bonbright, one whom President Roosevelt, when Governor, appointed to the New York Power Authority. Dr. Bonbright, in his book "The Holding Company," has the following to say:

"The holding company has now become such an essential part of the structure of large-scale business that its abolition would be serious, if not fatal, to the effectiveness of American industry.

"* * * The task of the legislatures, the courts, and the economists, in dealing with the holding company, is to understand and minimize the abuses to which it is subject, while recognizing and strengthening its social usefulness."

Let me read you further from the Chattanooga *News* of Dec. 13, 1935, a statement made by Dr. Arthur E. Morgan, Chairman of the TVA, in which he proposes the organization of a nation-wide Public Ownership Institute as a means of improving the administration of publicly owned utilities:

"The institute should maintain a central service organization of attorneys, accountants and engineers—men trained in the administration in a sort of consulting staff that would be available for all members."

These services mentioned by Dr. Morgan are some of the precise services which the utility holding company provides for its operating units.

When I speak of Commonwealth & Southern and North American Company as examples of different types of diversified systems, I do so merely by way of illustration. What I have said concerning them is equally applicable to all of the better diversified utility holding company systems.

In other words, the situation in this country today is that low rates with few exceptions are found in those companies that are parts of utility holding company systems. It is clear to any student of the utility business that to break up these systems will check the downward trend in utility rates.

When I pointed this out to one of the proponents of this bill, he told me that even if it would result in an increase in rates, he still thought it would be better for the American people to have big business broken into smaller parts, even if the public had to pay higher prices for their products. This statement gives rise to the interesting question of what was the real purpose of this bill.

The New York *Sun*, in a recent editorial (Nov. 27, 1935), described the Administration program against the utilities as follows:

"The real goal of the opposition is not regulation of the electric utility business but its replacement by public ownership. The strategy is plain: first all the powerful management corporations are to be broken up so as to deprive operating companies of the advantages of central financing and direction; then operating companies are to be 'integrated' into small territorial subdivisions; after that they will be destroyed piecemeal through ruinous competition with municipal and district public ownership units in which operating deficits will be made up by the taxpayer. After private concerns have been driven out of the field, the various public ownership groups doubtless will be 'integrated' again into a Federal system managed by bureaucrats in Washington."

To the comment of the New York *Sun* on the purpose of the opposition to the utilities, may be added Senator Wheeler's statement of the broad objective of the bill he fathered:

"For the private initiative of the holding company bent on a quest for private profit, this bill substitutes the public initiative of a Federal agency directed to the objective of public service."

The aim of this legislation, then, was frankly to supplant private initiative by that of a Federal bureau. I do not agree with Senator Wheeler that the profit motive and the service motive are incompatible. Quite to the contrary, most of our major industries, most of our large and small businesses perform a commendable public service in their effort to obtain private profit. However, if these two statements correctly disclose the ultimate objective of this campaign against the utilities, which is merely a prelude to similar action concerning other industries, it may well be asked whether the consummation of the program or any part of it is worth the cost to the American public in dollars and cents.

To the rejection of the compromise proposal there should be charged the promised expenditure by the utilities reaching toward $500,000,000 for capital goods, $60,000,000 free electric energy to the customers of the utilities and the reasonable promise that the compromise would release in all a pent up demand of $3,500,000,000 in consumers and producers goods. All this, with its far reaching effects, was sacrificed merely that the letter of the death sentence might be retained and laboratory experimentation practiced on what was left of the utilities.

It is pertinent to ask why the utilities themselves, without awaiting any sanction from or concessions by the Administration, did not proceed to make avail-

able the objective rate and expend additional capital for construction purposes. The reason is obvious. Utility properties cannot be expanded; rates cannot be reduced; capital expenditures cannot be made against the uncertainties of the threatened invasion of a business by government.

Today one billion dollars of utility property constituting 8 per cent of the entire electric utility property of the United States is rendered completely unable to finance itself without the assistance of holding company advances because of the mere existence of the Tennessee Valley Authority. This Authority sits as a constant threat and potential invader of the territory of every operating utility company within transmission distance of it. Likewise, such conditions exist wherever the government grants 45 per cent of the cost and loans the balance at low interest rates to municipalities to duplicate the existing systems of utility companies.

In this group of investment bankers to whom I am talking, there exists not one who will finance at reasonable prices and interest rates any utility property within the threat of the government activities. If it were not for the fact that the holding companies were supporting companies thus attacked, they would be compelled to discontinue construction activities.

If the utility industry knew today that it could reach a reasonable compromise with the Administration by which the death sentence of the Wheeler-Rayburn bill could be repealed and the sane regulation of the industry established and the invasion and duplication of its systems directly and indirectly by its own government could be removed, it could double its capital expenditures tomorrow. It could begin a program which would put hundreds of thousands of men in this country back to work largely in the manufacture of durable goods and construction work where all economists agree lies the necessity for activity in order to produce the return of economic prosperity.

Now there is a calm as the battle moves from Congress to the courts. The utility companies had no choice, faced as they were with extinction, and of necessity had to file suits in an effort to stay the application of the Wheeler-Rayburn death sentence bill.

The issue is in the courts. That is not the place, in my opinion, where it should be. Courts settle questions but they do not dispose of problems and even if a court decision would forever remove the public utility question from public discussion, the Nation must pass through a long travail of uncertainty and unemployment before any final decision from the courts may be reasonably anticipated. Yet there is a way in which this utility problem can be solved quickly, effectively and to the advantage of virtually every consumer of electric energy, every investor in public utility securities and to both the immediate and ultimate benefit of the country. The time has arrived in the utility controversy for moderate, sober, patriotic men to call for this sane solution.

Congress meets in January. It has already given long study to the public utility question. In the closing days of the last session it passed a hastily drafted measure, embodying some of the provisions which the House had twice rejected and which the Senate supported by the scant margin of one vote. In the period of sober second judgment which has now arrived in the utility controversy, Congress can solve this problem and free the country from long and distracting litigation by passing a reasonable public utilities bill.

This can be accomplished either by an amendment to the present bill or by the introduction and passage of a new bill. Such a bill should make the issuance of all utility holding company securities subject to the approval of the Securities and Exchange Commission and empower it to prohibit the issue and sale of securities found to be detrimental to the interests of the investing or consuming public; require all utility holding companies which do not have their securities listed on a registered stock exchange to register with the Securities and Exchange Commission, thus making them subject to all the provisions of the present Securities Exchange Act; regulate the relationship between public utility holding company and any affiliate so as to prohibit upstream loans, excess profits from service, engineering financing charges and any and all other abuses alleged against utility companies during the boom era; authorize the Securities and Exchange Commission to prescribe uniform systems of accounts for holding companies; provide for the creation of interstate power boards to pass upon interstate power rates whenever requested by one of the State Public Service Commissions concerned or by a party to a contract prescribing such rates.

These specific suggestions should be supplemented by any other provisions necessary to fully protect the industry, the consumer and the public against those abuses which were common to all industry during the extravaganza of speculation immediately prior to 1929.

Neither social justice, economic reason or constitutional authority support the principles of the death sentence. In its essence it means that any company owning systems located in different parts of the country, no matter how small such systems may be, must be prepared, at the uncontrolled discretion of a Federal Commission, to dispose of all but one of such systems shortly after Jan. 1, 1938. What responsible holding company official can afford under such circumstances to expend capital funds on the expansion of such properties when he knows that their disposition will occur in a market glutted by similar forced sales?

Approximately 80 per cent of the operating utility companies in this country today are parts of utility holding company systems. Those utility operating companies which are located in the more prosperous economic sections of the United States and which are unaffected by Federal power projects such as the TVA are still able today to meet their capital requirements by the issuance of bonds and preferred stocks but no prudent utility holding company executive in the light of the present law and litigation can authorize the investment of money of the holding company in the common stocks of such companies thus providing the proper relationship between the senior and the junior securities and retain an adequate cushion behind the senior security.

Those utility properties located in the areas in the country subject to the attack of the Federal power projects and induced municipal duplication of their systems have no place to turn for their excess requirements of cash for construction purposes except to the holding company and the holding company finds itself in a position where it can respond only most niggardly to those requirements. The result of all of this is that construction budgets of utility companies, of necessity, are being cut to the bone.

Tens of thousands of men in the heavy goods industries are praying for employment and economic freedom. Tens of thousands of men can be put to work in utility construction if sanity will but prevail and the present bill be amended

at the next session of Congress. Surely, the haters have occupied the stage long enough. Venom and calumny have had their full day. Let us give a little time to constructive effort so that work—not debate—can be applied to this problem. Unless we can reach a saner solution than that contained in the existing legislation, we have failed miserably as a nation in the handling of the utility question, which after all, when freed from personal ambitions, political aims and aspirations and stripped of all punitive and retaliatory features, is not so baffling or abstruse.

Now in the discussion of this utility question, I have done a good deal of talking, and if I have neglected a good many important points, I probably have not missed as many as I have good places to stop. If I have said anything in rancor or spoken of anyone in bitterness, I am sorry, and if I have attempted to be jocular or facetious, I hope my remarks have been accepted in a spirit of fun. I am not interested in any benefits to politicians or parties that may be won out of this public utility problem. In my discussion I hope to impersonalize the issue and deal with it on the basis of logic and economics rather than the individuals involved. In my opinion, the issues at play in this question and the consequences of the course selected for dealing with the electric power companies transcend in importance the personalities of any men, whether they are in public life or in private endeavor.

I do not undertake to condone many of the actions of utility management during the days of speculative frenzy. I think the utility industry must keep its own house clean. Unfortunately, from a few isolated acts, the impression has been created throughout the country that the officials of public utility holding companies with diversified properties are men solely in the pursuit of greedy and selfish purposes. I know most of them personally — Groesbeck, Muhlfeld, Hogarty, Tidd, Zimmerman, Jones, Gossler, and many others. They are and have been greedy during this fight but it has not been greed for money—it has been the greed for punishment in the protection of the rights of their stockholders. They have been selfish—selfish to carry out the utmost obligation of their trust.

The corporation of which I have the honor to be the President has over two hundred thousand security holders; I yield to no public official in the exalted obligation that such a trusteeship imposes upon me.

The electric utility industry under private initiative has played an important part in the upbuilding of the American nation. It looks for opportunity to continue its career of service and expansion, recognizing its ability to bring new constructive forces to play in speeding economic recovery. If that recovery be much longer delayed by artificial hurdles and punitive legislation our country will soon be flooded with a new deluge of panaceas which may engulf both our economic and our political systems.

The responsibilities of today rest with our political leaders and those who occupy the forefront and hold the positions of trust in industry and business, and to both groups the people have a right to turn at the present hour. Let both forget the acrimonies of the past and join in a common purpose of restoring economic prosperity to our distraught country.

I put the question—could any single act do more to restore the confidence of American business than for Congress in its January session to enact a reasonable public utility law?

LIGHTNING REFERENCE BOOK

Plans are being made by the Lightning and Insulator Subcommittee of the Power Transmission and Distribution Committee of the American Institute of Electrical Engineers to issue in one bound volume most of the papers on, and relating to, LIGHTNING which have appeared in American technical publications *(A.I.E.E. Transactions, General Electric Review, Electrical Journal,* and *Electrical World)* from 1918 to 1935. Some few foreign publications may be included.

More than 250 papers and technical articles have already been indexed. The proposed cloth-bound book will probably be 9 in. x 12 in. x 2½ in. thick and comprise some 1300 pages text, illustrations, author, and subject indexes. A more detailed description of this proposed volume will be found in *Electrical Engineering,* August, 1935, page 907, and September, 1935, page 918 and page 1008.

The cost of this book will depend on the number of copies which can be sold. If 1000 copies can be sold, the price should be about $5.00 each. If only a small number of copies are called for, the cost per book may be so high that the entire project will have to be abandoned.

This is a last subscription drive by the Lightning and Insulator Subcommittee to determine the demand for the proposed book. This publication is planned on a no profit basis, and merely for the benefit and convenience of those interested in the lightning problem, particularly as it affects the electrical industry.

If you wish to have a copy of this Lightning Reference Book, fill out the attached coupon and mail at once. Those ordering after the book goes to press are subject to disappointment, as it is planned to print only a few extra copies.

Mail the coupon now to Editorial Department, American Institute of Electrical Engineers, 33 West 39th St., New York, N. Y.—*Tentative closing date for orders, February 1, 1936.*

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Electrification in New Zealand

By H. S. Bennion

Edison Electric Institute

IN a further effort to disparage progress in rural electrification in the United States the Rural Electrification Administration, in a newspaper release of December 27 and in the December issue of "Rural Electrification News," makes some unfavorable comparisons between rural electrification in New York State and in Texas on the one hand and in New Zealand on the other hand. The Administrator states that at the beginning of 1935 approximately one New York farm in three had electric service, while in New Zealand over two farms in three were electrified, pointing out that the density of population in New Zealand is only one-eighth as great as the population of New York State outside the metropolis.

Neither the number nor percentage of electrified farms in New Zealand is shown in official statistics of that country. Absence of such data in articles and speeches by power engineers and other officials of New Zealand is evidence that figures on farm electrification have not been compiled and therefore that any figures used are guesses or estimates. It is evident, however, that there is a high percentage of farms having electric service in that country.

Comparisons, particularly between two situations far apart, are of limited value and misleading unless conditions in each case are similar, or full account is taken of at least the more important differences. In New Zealand the population and the farms are concentrated in limited areas. One-half of the farms are dairy farms. The local authorities have broad taxing powers to pay for power facilities and to make up operating deficits.

In New Zealand 95 per cent of the population is concentrated in 20 per cent of the total area of the islands. The remaining 80 per cent is largely mountainous and for that or some other reason very sparsely populated. The total area is 103,415 square miles and the total population in 1934 was 1,549,000. Most of the pepulation live in an area of 21,000 square miles. Texas, with an area of 265,900 square miles, has its population of 5,825,000 more widely distributed over the total area. The same is true in New York State, although its average population density outside the metropolitan area is nearly double the average for the populated districts of New Zealand.

New Zealand is a dairying country. Dairy products constitute its biggest export business. In 1929, out of a total export trade of £93,000,000, butter, cheese and condensed milk accounted for £24,000,000 and meat products another £16,000,000. In 1928, the proceedings of the Electric Supply Authority Engineers Association show that the peak loads on the rural lines were established by the milking operations twice a day.

New Zealand has 84,368 farms averaging 25 acres of crop land per farm. Slightly over half, or 42,579, are dairy farms with the very high average of 40 cows per farm. New York State is a dairying state but only 40 per cent of its farms are classed as dairy farms and these have an average of only 14 cows per dairy. There are 159,800 farms in New York with an average of 51 acres of crop land per farm. 68,100 of the farms are dairy farms but many of these are combination fruit or other crop farms and have but a few cows. Texas has a very different situation with 495,000 farms scattered widely over the state and averaging 70 acres of crop land per farm. Only 8,070 or 1.6 per cent are classed as dairy farms.

The fact that half of the farms of New Zealand are dairy farms, and only 1.6 per cent of the farms in Texas are of that class, explains in part why Texas has a much lower percentage of farm electrification than New Zealand or than many other parts of the United States. In the principal dairying sections of this country all or practically all the larger dairy farms, that is, those with 20 or more cows, are electrified. Of all the general classes of farms, dairy and poultry farms can make the most profitable use of electricity and consequently have by far the highest percentage of electrification. Large electrified dairy farms are in reality commercial enterprises. In this respect they are comparable to the fruit and truck farms in California using electricity principally for irrigation pumping. Such use is so large in comparison with ordinary farm uses that for statistical purposes it is classed as industrial power so as not to mask general averages. In California, which has 60 per cent of its farms electrified, the average use for all purposes for all electrified farms, including pumping, in 1934 was 14,470 kilowatthours per farm. The average of 830 kilowatthours per annum for farms east of the 100th meridian, although influenced substantially by some irrigation pumping, by large dairy farms and by some special farms with high usage, nevertheless, comes nearer representing what the general farmer with electric service uses than is the case with most averages where the large and small users are lumped together. This is the case because so much effort has been expended in exploring and developing a variety of profitable uses for electricity on the farm.

In a paper discussing the organization of electricity supply in New Zealand, presented before the British Institution of Electrical Engineers on December 20, 1934, Mr. F. T. M. Kissell stated that electric service was available in all of the 21,000 square miles occupied by the principal population of the country, and that in 1934 there were 214,000 urban and 120,000 rural customers. What percentage of these 120,000 rural customers are farm customers was not indicated. In the United States, farm customers constitute 20 per cent of the rural customers. If this ratio applied in New Zealand, it would indicate 24,000 electrified farms, but since half of the farms of New Zealand are dairy farms and concentrated in a restricted territory, undoubtedly the ratio there is much higher than in the United States.

Although data showing the number of electrified farms in New Zealand are lacking, it is evident, from information given in a paper entitled "The Supply of Electric Power in Country Areas," read before the Electric Supply Authority Engineers Association in September, 1934, at Wellington, by Mr. N. G. McLeod, M.I.E.E., then president of that association, that rural lines do not in general reach into thin territory, as the term is understood in this country. He stated that in all the 95 electric supply authorities in New Zealand, the lowest annual revenue per mile of line

was £39, with 3.6 customers per mile, and, further, that only 10 supply authorities had an average annual revenue less than £70 per mile of line. Mr. Kissell, in the paper previously mentioned, stated that the four power boards, serving rural areas having the lowest revenue per mile of line, were as follows:

Malvern, with an average annual revenue of £39 per mile for 182 miles.

Wairere, revenue £44 per mile for 112 miles.

Ashburton, revenue £49 per mile for 870 miles.

Southland, revenue £49 per mile for 2,395 miles.

The foregoing revenues are from the sale of power only. These boards report revenue also from taxes and other sources to increase the total annual revenue to £54 2/ 5d, £50, £50 1/ 2d and £71 1/ 2d respectively. The average annual revenue from the sale of power alone for these four authorities was £48 1/ 3d per mile of line.

These revenue figures, particularly at the present time, cannot accurately be translated into similar revenue figures for this country by merely taking official rates of exchange. What actually counts is the relation of certain amounts of revenue in terms of wages and of food, rent and other items in the cost of living in the territories under comparison. But, lacking a better measure, if we take the New Zealand pound as $4, its average quoted value in 1934, the lowest annual revenue from the sale of power per mile of rural line in New Zealand at that time was $156, and the average for the four boards was $193 per mile per annum.

Mr. Kissell states further: "In practically no case now are lines being built or extended into areas unless sufficient revenue is in sight to provide for a reasonable return on the investment. In many cases the Loans Board is insisting on a guaranteed revenue equal to 17 per cent of the capital cost being available before authorizing loans for extension purposes."

The statistics of local power boards in the rural territories shows practically no lines built in recent years. Mr. Kissell confirms the fact that the government has not been extending lines into thinner territory because, although the number of customers per mile of line in New Zealand dropped during the period 1921 to 1926 from an average of 32 to an average of 15, it has remained practically stationary at that level since that time.

Government Subsidy

The production and supply of electricity in New Zealand are almost entirely a government enterprise. The Water Power Act of 1903, the Municipal Corporations Act of 1920 and the Electric Power Boards Act of 1925, with intermediate amendments, established this condition. Important expenditures for power began in 1920. The Electric Power Boards have broad taxing powers. Upon approval of 60 per cent of the voters, a Board has power to levy a uniform special tax over all taxable property in the Board's district or in such part of it as is specified in the loan proposal as security for interest and sinking fund on the loan. It also has authority, in order to make up any deficiency in the estimated revenue and expenditure for any year, to levy a tax to make good all or part of the estimated deficiency. A further separate tax may be levied within any defined portion or portions of its district.

Indicating the extent to which this taxing power has been exercised, in the four boards serving the rural areas before referred to, Ashburton and Wairere have not resorted to taxation to make up deficits. Malvern levied no taxes from 1926 to 1930, but during the four years from 1931 to 1934 it raised about one-sixth of its gross income from taxes. Southland, since 1926, has raised from one-fourth to three-fifths of its gross income from taxes. In 1934 the income of the Southland Board was £48,072 from taxes, £119,542 from sale of power, £14,953 from other sources, making a total revenue of £182,576, or a total revenue from all sources of £76 ($304) per mile of line.

Electric Power Boards of New Zealand in 1934 owed £13,213,000. This alone was 20 per cent of the total indebtedness of local government in New Zealand. The percentage of electric debt to the total local government debt is still higher, however, since a considerable part of the borough debts, amounting to £29,266,000, was also incurred for electric power. In 1934 the ratio of indebtedness of the power boards to the capital they had invested in power facilities was 93 per cent.

In New Zealand the government carries a heavy burden to subsidize electric power. In the United States the electric light and power industry carries a heavy tax burden to support government. Very recently the state of Mississippi has undertaken to subsidize rural electrification to the extent of remitting taxes within extremely narrow limitations; namely, it exempts from state or local ad valorem taxes for a period of five years those non-profit rural electrification systems which buy their electricity from the TVA or other public power sources.

Production of Electricity in New Zealand

The installed generating capacity in New Zealand for the year ending March 31, 1934, was 331,210 kilowatts, or 0.21 kilowatts per inhabitant, as compared with 0.3 kilowatts per inhabitant in the United States. The total production of kilowatthours for the year ending March 31, 1934, was 685,052,000 kilowatthours, a per capita figure of 440 kilowatthours, as compared with a per capita production in

Southland Electric Power Board

Customers 9337—Miles of Line 2402

Lighting, Heating & Motor Power Rate

7.0	pence	(11.7c.)	per	kwh	first	21	kwh	per month
4.0	"	(6.7c.)	"	"	next	21	"	" "
2.5	"	(4.2c.)	"	"	"	42	"	" "
1.5	"	(2.5c.)	"	"	excess			

Discount 10% on kwh in excess of 17,000 per year

Cooking Rate	1.0	pence (1.67c.)	per kwh	(Ranges only)
Water Heater Rate	.625	pence (1.04c.)	per kwh	up to 1200 watts on cut-off switch with range or motor.

Minimum Charges

Lighting	4 pounds	($16.00)	per year
Range up to 5 kw	6 "	($24.00)	" "
" above 5 kw	8 "	($32.00)	" "
Milking Motors	10 "	($40.00)	" "
Occasional Motors (½-2 hp)	2 "	8 shillings	($9.60) per year

the United States for the same period of 700 kilowatthours.

Electricity in New Zealand is used very extensively for water heating. In the United States, of course, most of the water heating is done by coal, wood, oil and gas. There is also high saturation of electric ranges in New Zealand, whereas in the United States electric cooking has to face very severe competition.

Rates

Using the rate book published by the Electric Supply Authority Engineers Association of New Zealand, the retail rates for Southland, Tararua and Motueka have been selected from among the rates of the 95 local authorities as illustrating rural rates. Southland, chosen because it is the board serving rural territory with the largest number of miles of line, has an average number of customers just under four per mile. Tararua, with 213 miles of line, has about the average number of miles of line, and Motueka, with 12 miles of line, represents a very small enterprise.

A significant part of the Southland Electric Power Board rate is its minimum charge. For example, a rural customer taking lighting service with a 7 kw range, a milking machine and a general farm purpose motor would have a minimum charge of $97.60 a year, or more than $8 per month. In Motueka district, a customer using lighting alone pays 20 cents per kilowatthour, notwithstanding the fact that this line has 30 customers per mile.

By way of contrast, the domestic rate schedule of the Tennessee Valley Authority is also given. This domestic rate is to apply to rural and urban customers alike, except that for the present rural districts have been authorized to add 1 cent per kilowatthour.

Motueka—Borough Council

(365 Customers—12 Miles of Line)

Lighting Rate 1 shilling (20c.) per kwh
Power Rate 4 pence (6.67c.) per kwh

Minimum Charges

First meter 5 shillings per mo
Second " 2 " " "
Each additional meter 1 shilling per mo

Tararua Electric Power Board

(1606 Customers—213 Miles of Line)

Lighting Rate	8.0 pence	(13.4c.) per kwh
Lighting & Iron Rate (a)	8.0 pence	(13.4c.) per kwh first 10 kwh per month
	7.0 "	(11.7c.) excess; or
(b)	8.0 "	(13.4c.) per kwh for lighting
	4.0 "	(6.7c.) " " for heating up to 1500 W
General Rate—Availability heating and cooking		
	2.0 pence	(3.34c.) per first 200 kwh
	1.0 "	(1.67c.) excess
	Minimum charge 15 shillings ($3.00) per month	
Water Heaters on cut-off switch with range or motor		
	4 pounds	($16.00) per year for 500 W element
	4 "	16 shillings ($19.20) for 600 W element
	6 "	($24.00) for 750 W element
	8 "	($32.00) for 1000 W element

Tennessee Valley Authority

Domestic Rate

First	50 kwh consumed per month	@ 3c.	per kwh
Next	150 " " " "	@ 2c.	" "
Next	200 " " " "	@ 1c.	" "
Next	1,000 " " " "	@ 0.4c.	" "
Excess over	1,400 " " " "	@ 0.75c.	" "

Minimum Monthly Bill
$0.75 per Meter

Wholesale Rates

Of the four electricity boards mentioned by Mr. McLeod as having the lowest revenue per mile of line, Malvern is the only one which purchases all of the energy it sells. It pays $46.50 per kw of demand. In 1934 its load factor was 47 per cent and the power purchased averaged 1.12 cents per kilowatt hour. Energy lost or unaccounted for amounted to 37 per cent. The overall cost, including fixed charges, was reported to be 6.6 cents per kilowatt hour sold. The following table showing the purchases and sales of power for the Malvern Electric Power Board for the year 1934 is taken from the New Zealand Local Authorities Handbook, 1935.

Malvern Electric Power Board

(653 Customers—182 Miles of Line)

Cost of purchased power.	£2,462	$9,848
Total operating cost.....	£5,131	20,524
Total expenditure incl. fixed charges.....	£9,430	37,720
Max Load 212 Kw		
Cost of power per kw demand	$9,848 / 212	= $46.50
Total expenditure per kw demand	$37,720 / 212	= $178.00
Kwh purchased. 877,320		
Kwh sold..... 571,400		
Unproductive .. 37.15%		
Cost of power per kwh purchased	$9,848 / 877,320	= 1.12c.
Cost of power per kwh sold	$9,848 / 571,400	= 1.72c.
Total expenditure per kwh sold	$37,720 / 571,400	= 6.6c.

Conclusion

Although no official statistics for New Zealand are available, enough information is known concerning electric service in the various sections of the United States and in New Zealand to warrant the assertion that a survey of an area of 21,000 square miles in the United States most nearly comparable to the 21,000 square miles of populated areas in New Zealand would show a higher percentage of electrified farms than the Rural Electrification Administrator claims for New Zealand, and that on the farm more uses are made of electricity.

Electrification in New Zealand is heavily subsidized by the government. It is heavily taxed in the United States.

The electric light and power companies in the United States, in general, would find no difficulty in operating under the average rural rates in New Zealand; provided extensions into thin territory were limited, as they evidently have been in New Zealand, so that the area with the lowest average had 3.6 customers per mile of line and so that there would be assured an average annual revenue comparable to the total annual revenue from all sources reported for 1934 for the local boards of Malvern with $204, Wairere with $196, Ashburton $202 and Southland $304 per mile of line.

Resuscitation From Electrical Shock*

By Wills Maclachlan

Chairman, Subcommittee on Employee Health of the Accident Prevention Committee, E.E.I.

THE electrical public utility industry has for a considerable number of years shown an active and continuous interest in methods for the prevention of electrical accidents and in remedial measures after electrical shock. Representatives of the industry took an active part in the Commission on Resuscitation after Electrical Shock of 1913 under Dr. W. B. Cannon of Harvard University and in 1917 under Dr. S. J. Meltzer of the Rockefeller Institute. They were responsible for the initiation of the activity to standardize the Prone Pressure Method of Artificial Respiration put forward by the late Sir Edward Sharpey Schafer, F.R.S., which was so ably carried to completion under the chairmanship of Dr. L. R. Thompson of the U. S. Public Health Service in 1927.

As a practical evidence of this interest, many thousands of employees have been trained in the Prone Pressure Method of Artificial Respiration and are required to regularly practice it. Since 1922, medals of award for meritorious cases of resuscitation from electrical shock have been available for employees of Public Utility organizations and a very considerable number of medals have been awarded. An analysis of these medal files shows that a great number of lives have been saved by these trained employees and there is no doubt that many additional lives have been saved by employees for which no application was made or in which the accident was from gas poisoning or drowning.

To further the knowledge of the effects of electrical shock on the human body, representatives of the industry have shown an active and practical interest in laboratory work carried out by staffs of the Medical Faculties of various Universities, with the result that scientific knowledge of the effect of electrical shock has been greatly enlarged and a number of apparent facts found in reports of electrical shock cases have been either explained or have been shown to be untrue. Coincident with the work in the University Laboratories, a collection of field information or exact reports of actual cases of electrical shock have been collected and carefully analyzed. The results of this analysis have been published and have been made available to the laboratory workers and to others, who have been either interested or actively engaged in endeavoring to solve the problem. The result of this work has been incorporated in instructions for artificial respiration after electrical shock and has been made available to the Medical Profession to improve the treatment of electrical shock cases.

The members of the Committee on Employee Health have endeavored as far as possible to learn of any new methods of artificial respiration which have been put forward. Some of these methods have necessitated the use of apparatus and other methods such as the more recently put forward Holger Neilsen Method, have been a combination or a modification of old manual methods of artificial respiration. A careful study, in the light of field experience, has been made of these various methods; also where possible the methods have been tested in the laboratory in comparison with the Standard Technique of the Prone Pressure Method.

The Committee very definitely feels that the Holger Neilsen Method should not be used as a substitute for the Schafer Prone Pressure Method of Artificial Respiration at the present time. Much more extensive study and investigation is necessary before it, or any part of it, is either discarded or adopted. Certainly this study should be under the supervision of research experts in the field of resuscitation.

It has been generally found that a new method has a limited vogue for either some months or a year or two and in the light of experience has been abandoned.

It is no doubt true that some of the electrical public utilities are experimenting with the use either of new methods or a modification of the Standard Technique of Schafer. Many of these experiments quite rightly are not given publicity, but your Committee would wish to be informed even in confidence of any experiments which are being carried out so that it may be informed of any recent developments in order that this information can be taken into consideration in giving advice to the whole industry. Public Utilities, however, are warned that in carrying out such experiments human lives may be endangered. While experimental work on animals in a well equipped University Laboratory is much to be desired, the translation of these experiments in the use on human beings should only be undertaken in the full light of the responsibility that is to be shouldered.

In the light of the investigations that have been carried out, your Committee would present the following findings:

1. That it formally endorses again the recommendation of the training of employees in the Standard Technique of Prone Pressure Artificial Respiration, based upon the work of Sir Edward Sharpey-Schafer, formally adopted in 1927.

2. It is definitely felt that to date there are no known drugs that can be administered which are of value during resuscitation from electrical shock.

3. It is particularly stressed that Adrenalin and Methylene Blue are contra-indicated in cases of electrical shock.

4. Inasmuch as artificial respiration is the only treatment, this Committee urges that greater stress be put on the education of employees in the Standard Technique of Prone Pressure Artificial Respiration and to assist in this education that an adequate supply of charts and booklets setting forth this Technique be made available to employers and employees.

*This statement has the endorsement of the whole Subcommittee on Employee Health:

WILLS MACLACHLAN, chairman.

DR. HART E. FISHER, Chief Surgeon, Public Service Co. of Northern Illinois, Chicago, Ill.

DR. NOEL G. MONROE, Medical Director, The Edison Electric Illuminating Co. of Boston, Boston, Mass.

DR. MORRIS VITELES, Director of Personnel Research, Philadelphia Electric Company, Philadelphia, Pa.

DR. J. J. WITTMER, Medical Director, Consolidated Gas Company, New York City, N. Y.

Bogies

A Factor in Planned Selling

By C. E. Greenwood
Commercial Director, Edison Electric Institute

ALL business is checking up on the outlook for the coming year. This is not the time to dwell on the accomplishments of the past, although the year 1935 has been one of unusual achievement in industry. But while many other industries have been declaring extra dividends, and have been registering unusual earnings, the utility industry has been glorifying in record energy output, but, comparatively speaking, mediocre earnings. We in the electric utility industry have many angles to consider in our market development, because ours is a business which in recent years has been picked by governmental authorities for restrictive and punitive measures which must necessarily detract from the time given to constructive business development. Also the handicap of unfavorable local public reaction to government propaganda must be surmounted.

The job facing the commercial departments of electric utility companies is becoming one which needs keener marketing sense, greater knowledge of the purchasing public, aggressive competition with other industries, and therefore sales organization equally strong and effective to meet this competition, and, lastly, greater sales expansion of electrical equipment to make up for replacements, and for the vagaries of housewives in utilization of appliances in the home.

PLANNED SELLING, where formerly practiced by a few, is now the call of all well-organized commercial departments. The commercial executive must hit on "all sixteen" and cannot rest his case on a selected few markets.

He is setting definite markers for his ultimate goal, commonly referred to as *Bogies*. This applies especially in attaining the residence market, because the residence load offers greatest present inducement for stimulation and accomplishment. However, the commercial and industrial classifications cannot be taken for granted, and are due for major sales offensives. In the residence field, companies that have rates which encourage cooking and water heating services have been aggressively load building with these leaders. Range sales increased approximately 75 per cent in 1935. The refrigerator ways are well lubricated, and sales momentum is pushing totals into new high ground in all sections with an increase of approximately 22 per cent. The value of radio as a load builder is now well recognized. Incidentally, there are manufacturers who would like to see utilities selling and promoting radio sets, and have expressed the opinion that it would be an asset for the radio industry in helping to stabilize prices. This is a problem to be worked out within the radio industry itself. Utility men might be thinking it over.

When the electric refrigerator field was being vigorously plowed, the utility slogan was "One electric refrigerator in the home will double average annual consumption." And again the commercial executive reasoned that the electric refrigerator offered a greater return per kilowatt of demand than any other class of domestic business. The range, water heater and radio were also among the major load builders. No wonder that the minimum of time was placed on lighting development. And then came the expression of thrift on the part of consumers following the boom year of 1929, and lighting was put at top place in the household "savings" column.

When the Better Light-Better Sight movement started, lighting was the neglected service. Results in selling the major household equipment list had been so effective that it is not surprising that energy output for residence lighting, in percentage of the whole, was small indeed.

We cannot expect, with the ever-increasing totals of refrigerators, ranges, water heaters, oil burners, air-conditioning units and radios that are being connected to the lines and which use so many more kilowatt-hours than normal use of light, that the percentage of kilowatt-hours can increase on our output charts without organized plans for educational work with the public, and vigorous and sustained sales drives. Through Better Light-Better Sight we are on the way.

The commercial motives of Better Light-Better Sight, as sponsored by the Institute are: First, to retard and finally stop the downward trend of energy output for residence lighting in particular, and then to start a permanent upward movement toward greater application and use of adequate light. Lighting is paid for on the top steps of the rate schedule, and revenue from it is vital to our financial well-being.

The Electrical Housewares Program is giving full consideration to the small appliance market, ever-expanding and important in its contribution to energy use.

The individual sales activities on refrigerators, ranges and water heaters are combined in one cooperative movement—the National Kitchen Modernizing Program — to make the public kitchen-conscious, to improve this neglected room, and modernize by installing electrical equipment. If there are local tie-ins with all these promotional programs, energy output "bogies" will be more easily obtainable.

Although planned selling has been the practice of some of our commercial departments over a long period, the objective often has been measured in volume of merchandise sold rather than on the increase in annual sales of kilowatt-hours to homes from year to year. However, the trend of thought is in this direction of the latter, and some of our progressive companies, most active along commercial lines, have shown almost straight-line increases. The trend of these curves of energy output has been the basis of setting bogies for one year, two years or three years in advance.

A recent questionnaire among 122 utility companies indicated that it was standard practice in slightly more than 50 per cent of them to set sales bogies on the increase of energy output in resi-

dence business. About 60 per cent of those establishing bogies since January, 1935, set them for two and three years through 1937.

It is of interest that twelve companies answering the questionnaire sell over 1000 kilowatt-hours on an average to their residence customers over the year.

Further analysis reveals that an average increase of 200 kilowatt-hours is the maximum set for 1936 over 1935 and for 1937 over 1936. A score of the companies in this group, if successful in the goals they have set, will be selling well over 1000 kilowatt-hours average per residence at the end of 1937.

The highest average reported in 1935 was 1700 kilowatt-hours for the Mesilla Valley Electric Company, Las Cruces, New Mexico, and the second highest was Washington Water Power Company, Spokane, Washington, with 1566 kilowatt-hours. The Pacific Power & Light Company at Portland, Oregon, was third highest in the group, reporting with 1294 kilowatt-hours.

In 1928 the Merchandising Committee of the old National Electric Light Association conducted a national contest among electric utility companies for the greatest increase in average domestic consumption accomplished that year. The slogan was "One More Kilowatt-Hour per Day," and at that time the national average was 433 kilowatt-hours, but it has been demonstrated that any such increase would have been far beyond the possiblities of the times. It was a shining star to shoot at, and proved effective in results.

What should give Commercial Executives greatest encouragement is the recording of average increases as high as 200 kilowatt-hours. It is convincing indication that as the electric range and the water heater arrive at the popularity of the refrigerator that "One More Kilowatt-Hour per Day" added to the energy output per residence consumer is not beyond the realms of practical achievement.

IMPORTANT SALES MEETINGS IN MARCH

(See Schedule on Page 38)

SALES—ELECTRIC REFRIGERATORS

(Household Models Only)

MONTH OF NOVEMBER AND FIRST ELEVEN MONTHS OF 1935—1934

	Month of November, 1935	Month of November, 1934	Month of October, 1935	First Eleven Months, 1935	First Eleven Months, 1934
Total United States	*46,930*	*28,718*	*43,706*	*1,514,119*	*1,301,049*
Maine	98	166	90	7,568	6,777
New Hampshire	105	98	76	5,516	4,624
Vermont	14	80	46	3,372	2,729
Massachusetts	2,238	1,233	1,845	61,585	50,567
Rhode Island	253	333	123	7,749	7,676
Connecticut	561	437	367	23,381	18,194
Total New England	3,269	2,347	2,547	109,171	90,567
New York	7,421	5,483	8,058	180,879	180,736
New Jersey	2,881	1,621	1,809	64,216	57,363
Pennsylvania	4,454	2,801	4,657	117,606	117,177
Total Middle Atlantic	14,756	9,905	14,524	362,701	355,276
Ohio	4,607	2,343	2,634	100,355	87,938
Indiana	1,433	608	728	37,901	33,031
Illinois	2,955	2,251	2,933	146,951	93,819
Michigan	2,869	759	1,663	62,908	48,844
Wisconsin	633	514	486	25,302	20,579
Total East North Central	12,497	6,475	8,444	373,417	284,211
Minnesota	320	276	342	20,827	16,921
Iowa	289	263	327	24,219	19,925
Missouri	1,527	1,058	553	44,545	50,918
North Dakota	29	53	35	3,951	3,087
South Dakota	41	90	85	5,028	4,044
Nebraska	321	224	177	16,072	14,267
Kansas	478	814	188	18,871	20,558
Total West North Central	3,005	2,778	1,707	133,513	129,720
Delaware	34	105	96	3,109	2,992
Maryland	448	716	451	21,092	24,882
District of Columbia	36	240	698	11,680	12,348
Virginia	303	148	465	21,283	20,943
West Virginia	242	192	197	15,447	17,475
North Carolina	336	147	429	25,114	20,028
South Carolina	327	58	243	12,755	9,517
Georgia	479	136	452	27,610	29,030
Florida	2,388	1,506	3,080	26,896	16,389
Total South Atlantic	4,593	3,248	6,111	164,986	153,604
Kentucky	660	324	308	17,250	19,136
Tennessee	408	221	400	24,518	26,419
Alabama	386	(5)	351	21,798	16,511
Mississippi	13	49	139	7,174	5,095
Total East South Central	1,467	589	1,198	70,740	67,161
Arkansas	31	63	4	9,917	8,827
Louisiana	510	183	498	14,615	9,568
Oklahoma	465	102	175	16,849	17,362
Texas	1,545	319	1,708	62,422	51,419
Total West South Central	2,551	667	2,385	103,803	87,176
Montana	37	31	63	6,236	5,009
Idaho	26	42	65	6,940	4,270
Wyoming	19	44	33	2,460	2,189
Colorado	65	179	232	11,466	10,337
New Mexico	56	27	48	3,249	2,408
Arizona	57	13	104	5,616	3,484
Utah	89	28	40	7,260	5,775
Nevada	32	24	44	1,869	1,233
Total Mountain	381	388	629	45,096	34,705
Washington	671	127	454	21,796	17,657
Oregon	171	201	243	14,306	14,908
California	3,569	1,993	5,464	114,590	66,064
Total Pacific	4,411	2,321	6,161	150,692	98,629

Figures based on report issued by the National Electric Manufacturers Association.

Pot Shots in Engineering

By Stanley Stokes

Consulting Electrical Engineer, Union Electric Light and Power Co., St. Louis

A paper presented at a meeting of the Electrical Equipment Committee, E.E.I., Chicago, Oct. 7-8, 1935

THERE is little doubt that those of us who have remained on the engineering payroll during the past depression have learned much from rate cases, appraisals, questionnaires, sales programs and so forth, but I wonder if our attention has not been too long diverted from engineering. Now that the utility problem has been completely settled by Washington we may perchance give thought to the effects of depreciation and obsolescence which have crept upon us like a thief in the night. For the past five years there has been little new construction and for the first time the electric utility industry finds itself with more old equipment than new. Heretofore depreciation has not been quite as serious an item because continuous expansion required so much construction that the larger portion of the system was new. As shown in Fig. 1, 85 to 90 per cent of system investment is now over 5 years old as compared with a pre-depression figure of about 63 per cent. This is a situation which the companies must face in their dealings with regulatory bodies and to which we, as engineers, must also give serious consideration. It is much like buying shoes for a boy—as long as the boy grows so fast that the shoes are too small by the time they need resoling there is no point in paying the shoemaker to repair them. But when this headlong growth stops it is economical to refurbish the shoes and, if they are to continue to be useful, they must be repaired.

New blood has come into our engineering organizations in negligible quantities during the depression and I hope that our engineering brains have not rusted down as much as some of our cold boilers have. We have been told that "life begins at forty"—perhaps some of us are old enough to start showing signs of that life. We older engineers can serve best by directing the energies of our younger engineers into the investigation of every nook and cranny of our systems and particularly into those things which have been done by the same method or rule of thumb for years. It seems to me that much useful work has been done along this line by presenting papers on jobs well done. This cooperative effort should be extended, perhaps in a most valuable way by presentation of reports showing why certain schemes and plans did *not* work. There is also the possibility that cooperative studies might be carried out but, in general, "committee engineering" is not satisfactory.

At the risk of boredom on your part and presumptuousness on mine I offer to you these rather rambling pot shots in engineering in the hope that I may

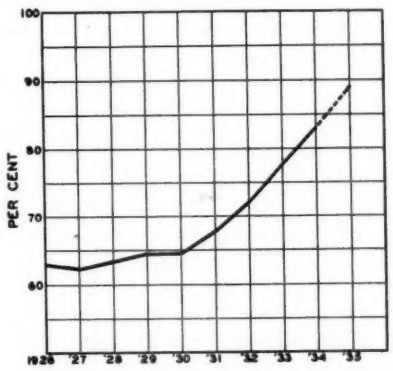


Fig. 1

arouse your interest in some phase of our mutual problems that you may have previously overlooked, and offer additional encouragement to a modern viewpoint.

Power plants seem to be the prime consideration in the electrical business.

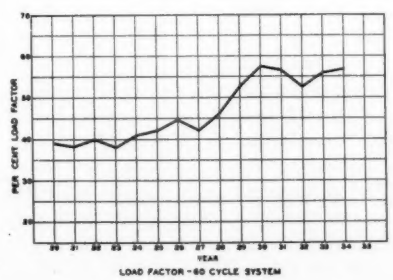


Fig. 2

For proof of this I need only to refer you to the feverish power plant construction of TVA. Like they do I shall talk about distribution systems later and let sales takes care of themselves. Although, if one is to judge by modern advertisement illustrations, sales activities must be very interesting. As an actual matter of fact power plants do account for from 25 to 40 per cent of system investment and therefore deserve about that percentage of engineering. I suspect they may get an even larger percentage although the equivalent amount of money spent elsewhere on the system in smaller units may offer opportunities for larger improvements in the balance sheet.

The recent improvement in system loads is causing engineering departments to give thought to generating capacity additions because the power plants built in Colorado, Washington and Maine will not help some of us carry our load. In view of the experiences of the past four years the managements will doubtless insist on a rather complete answer to all three phases of the problem, i.e. (1) Why do it all? (2) When do it, and (3) How do it? In the case of capacity additions the first two questions are answered by load studies and predictions. In our analysis of this situation we are considerably concerned over the load factor situation. Fig. 2 shows the load factor of our 60 cycle system from 1920 to date and indicates that it has been unusually high in the depression years 1929-34. "Will the load factor stay up or go down again?"—that is the question. We have materially improved the annual load factor of our domestic customers as shown in Fig. 3 and air conditioning may have improved the load factor of commercial customers somewhat. But, after all, the industrial load predominates and we would like to have someone tell us just what the resumption of industrial production will do to load factor. This point is of extreme importance where hydro plants or high operating cost steam plants are used to carry the peak.

The "How" to add capacity will be

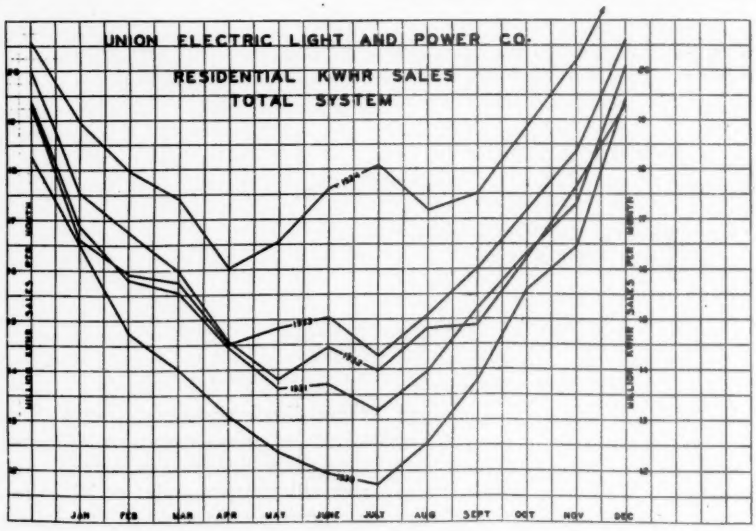


Fig. 3

different for each system and may take the form of new plants, rebuilding of old ones or interconnection, although the latter may not be so popular for a while.

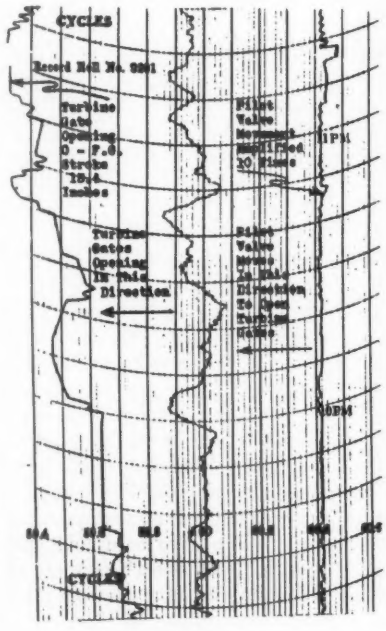
The refurbishing of the old steam plants by the superimposition of high-pressure high-temperature units has been discussed frequently in the technical press. In many cases this may be a sound and economical method of putting life in the old mule. It does seem, however, that there is some possibility that the remaining life of old equipment may be such that within a few years it may be necessary to "sub-pose" new low pressure units beneath the high-pressure superimposed ones. Then, too, the "superimposition" of steam equipment may turn out to be only an "imposition" on the electrical equipment. It is worthy of mention that frequently a rather complete rebuilding of switchgear is required when the steam end is modernized. These remarks should not be construed as disparaging "superimposition" but rather as a plea for a careful and complete analysis of each particular situation. Be sure to determine beforehand where your low cost peak capacity will be—if you modernize an old plant you may find your peak capacity will be made up of "not so bad" plants and your peak costs will be too high.

Even though the steam conditions are not changed it may be possible, as has been brought out by several papers presented before this committee, that the electrical equipment can be revamped with profit. Sometimes it may not be necessary to spend much money to remedy matters. We hereby offer a real contribution to the art—rather than install reactors and make other changes in our Cahokia plant to reduce the duty on breakers at least to their rating we recalculated short circuit data on new and correct values of generator reactance and thereby reduced the short circuit! This contribution is second only to that made by a prominent power company which, being unable to increase the clearance to ground of an old transmission line on which the insulator strings were lengthened, accomplished the end by the simple expedient of reducing the design wind pressure! We may further reduce the short circuit stresses at Cahokia by adding another double winding generator—our first one works very well. This emphasized to us that the largest unit rather than the number of units frequently determines the magnitude of the short circuit.

High speed breakers and relays have been of real help in meeting some rather awkward situations. This does not necessarily mean new breakers—older ones can usually be modernized at rather moderate cost. We have done a bit of this and find it worth while. Modern relays because of their greater accuracy and shorter time of operation will allow faults to be cleared regularly in a fifth of a second or less. Carrier current relaying, while somewhat limited in scope, is a special variety of modern relaying that deserves study. If you do use high speed relays you cannot rely on strip chart meters and relay targets to check the functioning of your relay system—nothing but an automatic oscillograph can tell whether relays work or not when the whole thing is over in the wink of an eye. On several occasions we would have been tempted to try a different relaying scheme if the oscillogram had not proven correct operation.

Have you made an honest effort to control frequency, time, tie line loading, etc.? We haven't although we have been fooling around with the idea for some time. It is quite possible that such control may be the only feasible method of getting by with the system loadings that may be required before adequate facilities are available to handle the next load hump. There is a lot of equipment available for this work although, apparently, we power men are behind the broadcast and telephone experts in this field. As a starting point, it might be a revelation to investigate your present governors and compare them with those now on the market. We used a photo-electric frequency recorder equipped with additional gadgets which gives a nice record — Fig. 4, and discovered that many governors respond to system needs with a "come up and see me sometime" attitude. Hydro plant governing has long been a controversial issue but it does seem that other things being equal a hydro governor should be a good one if at all.

Even though hydro plants do provide


CYCLES
Record Roll No. 2201
Turbine Gate Opening G - P.O. Stroke 12½ Inches
Pilot Valve Movement Amplified 20 Times
11PM
Turbine Gates Opening In This Direction
Pilot Valve Moves In This Direction To Open Turbine Gates
10PM
CYCLES

Record
from
HIGH SPEED FREQUENCY METER
equipped with
TWO MECHANICAL PENS
Chart Speed 3"/min. Frequency is center trace.

Fig. 4

power for nothing (refer to Norris, Lilienthal, Boulder Dam, TVA and all points West and South) they may require a bit of looking into. Out our way we had a "long dry spell" in 1934 and the darned dust wouldn't flow through our turbines or burn in our pulverized fuel burners. If you had the same drought it is possible that you should change nameplates and notebooks to coincide with what can happen. Hydro plants usually mean long lines and long lines provide the instability part of stability problems. Don't think that just because you have never felt the old ship rock that you cannot have instability. It is the last drink that puts you under the table and "crack the whip" is child's play until the line gets stretched out a bit.

Communication facilities play a major part in the safe and economical operation of a system. Are your communication lines adequate or can the "horse and buggy" epithet be applied? Carrier current is mighty handy when wire lines are down but your power circuit is up. Telemetering may let you operate safely closer to the wind provided you don't put in so much stuff that the system operator feels it necessary to do all operating in person.

Voltage regulation is a hardy perennial—it sticks right with us. And we must never forget that we spend a lot of money on voltage correction. An analysis of substation cost indicates that a substantial proportion of the investment is required for regulators, regulator auxiliaries and the space they take up. We discovered that induction voltage regulators serve to an astounding extent to make up for deficiencies in voltage supplied to the substation bus. We haven't figured out the answer yet, but do recognize some of the possibilities. For example, we have for some years held power plant busses at constant voltage, but we find that a few volts variation at suitable times will be of marked assistance and would allow us to get along without regulation on some circuits. In the same way, tap changing transformers for substation supply would be very useful. The real "nigger in the woodpile" is the poor power factor of the load. This actually limits feeder cable loading and summer generator loading seriously. We found that the "lead" and "lag" nomenclature and diversity of metering methods stymied us as far as an intelligent overall study of the situation was concerned. So we took the bull by the horns, set up a new system wherein reactive-volt-amperes are called vars, changed about half of our varmeters, and generally followed out the system suggested by J. Allen Johnson in an A.I.E.E. paper of several years ago. Now our operating department handles "vars" just as they handle "watts" and have little difficulty in farming it around to improve system voltage and stability conditions in so far as *facilities have been provided* for them to do so.

A few studies with regulation charts brought out forcefully the results to be obtained by power factor improvement. We don't know that we have the right answer, but we found that static capacitors can now be obtained at prices we can afford to pay—if the price could be further reduced by mass production we could use still more of them. We have installed on a more or less experimental basis, nine pole-type capacitor units of about 150 kva each.

Results so far are promising. If service records are satisfactory, we will probably enlarge upon this program. It looks to us as though this scheme merits serious consideration on many systems. It is, for us as engineers, an unfortunate circumstance that load accretions are now coming largely from existing customers in territory already served and the increase comes on the *lower steps of the rate*. If we continue to add substations and feeders as we have done in the past, our costs will be disproportionate.

During the depression there have been other regulator developments worthy of study. Perhaps some of these "Ford" and "Chevrolet" regulators may do just as well as the "Packard" type we have heretofore used. And we no longer overlook the fact that volts not lost in a high-impedance transformer are just as valuable as those picked up by induction regulators, heavier copper and additional feeders. Generator voltage regulators have been improved. It might be desirable to replace vibrating contact regulators with high-speed rheostatic type, not only because of reduction in maintenance and improvement in reliability, but because positive phase sequence voltage regulation is superior to "single phase what have you" voltage control.

I suspect that substation buildings and switch cells are too largely designed by architects and old handbooks. Will someone please tell me why an automatic substation should have windows? Do automatic relays use them? And why use concrete cells full of "rat-holes"? Steel is cheap, easily and rapidly worked, forms a solid ground, is fire-proof and takes up little space. It is as easy as driving a tack to put a stud in a "stud-gun," stick it to the steel wall and hang up a C.T. or Pot. You can tack up conduit about as easy as you can string Bx in an attic. Why spend weeks detailing drawings to show every insert, conduit, reinforcing bar, etc., when a simple sketch would suffice for the steel worker. After all, burning a hole through steel *is* easier than pushing one through with a chipping hammer.

And, by the way, you may be a good engineer, but that doesn't make you a good architect. A few hundred dollars architect fee may save you twice that much in simplification such as roof or cornice design and still give a much improved appearance.

Transmission lines are a necessary evil on power systems, but perhaps they don't have to be so evil. In the language of the old washerwoman—"If I do say it myself, as I shouldn't", here is a mark to shoot at. We have operated for four years a double circuit steel tower line 125 miles long and have had one single circuit and no other outages chargeable to the line. That figures out 0.1 outages per hundred circuit miles per year. This line isn't orthodox, it has wood cross arms but it works. A single circuit wood pole line of about the same length working at the same voltage and built at the same time, and according to the latest design, has had two lightning trip outs. On this basis the steel tower line has an operating record four times as good as the wood pole design. In addition, its first cost is less, maintenance should be less, right-of-way costs and clearing are less, and woodpeckers don't like steel. In four years, we have repaired or removed 971 woodpecker holes in the Osage wood pole lines.

On our Mississippi River crossing at Crystal City we have grafted monkey glands by putting up flashover protective gaps. We put them on in July and our operating record is too short to be conclusive, but in the three line disturbances that have occurred since gap installation, we have had only single line outages, although the oscillograph indicates that in one case the gaps prevented the second line from relaying. It is probable that we will have to slow down our relaying by a cycle or so to obtain full advantage of the tubes.

To sum up, what is most needed is a modern viewpoint unbiased by the past. Read the ads and learn how times have changed.

The Air Conditioning Symposium

THE popularity of air conditioning has indicated in its development so far the desirability of a degree of collaboration between the sales and engineering services of power supply companies even higher than that developed in connection with the older heavy appliances such as ranges and water heaters. As the successful sales promotion of these appliances has brought about notable changes in service entrance and metering practices and has exerted a definite and beneficial influence on house-wiring methods and materials, so also it may be expected that air conditioning in its many marketable forms will suggest, and probably demand, changes in construction methods and materials and in the design of the apparatus itself. This is more especially the case for the art of air conditioning since it involves not only electrical features, but water supply, architecture and most of the technology of heating and ventilating.

In view of these considerations, the Electrical Equipment Committee arranged a symposium on the subject at its autumn meeting in Chicago under the direction of J. F. Fairman, electrical engineer of the Brooklyn Edison Company, with the object of surveying the technical aspects of the subject and their relation to the sales situation.

Philip Sporn, Vice-President of the American Gas and Electric Company, and Louis Elliott, Consulting Mechanical Engineer of the Electric Bond and Share Company, presented papers showing the equipment available for air conditioning, and various ways in which this equipment could be combined and installed to meet specific conditions. D. W. McLenegan of the Air Conditioning Division of the General Electric Company presented a paper showing the value of air conditioning both in health and in human comfort. E. W. Lloyd, Vice-President of the Commonwealth Edison Company, and E. A. Freund of the Union Electric Light and Power Company, presented papers on the commercial aspects of air conditioning to coordinate for the engineers assembled the whole subject as now before the Electric Light and Power Industry. These latter speakers pointed out how the engineers of the companies could cooperate with the sales forces to further this development.

A limited supply of mimeographed copies of the complete symposium are available to member companies upon request to the Institute general office. The following is a condensation of some of the material presented at the meeting.

Installations

The simplest step in air conditioning is the use of a fan for ventilation and the circulation of the air. It is the most economical air conditioning system that can be installed, and probably yields the greatest amount of comfort for each dollar expended in installation and operation.

The application of a simple exhaust fan in the attic of a house will make the entire residence much more comfortable, not only after dark when the outside air is cooler, but also throughout the whole day. With such an installation the entire air in the house can be readily and quickly replaced with outside air. If this fan is started up slightly after sundown the whole house can be cool and a gentle breeze insured in any of the desired rooms that are occupied, by proper opening and closing of the house windows. Such an arrangement would insure that each day was begun with the building and its contents cooled to the outside temperature of the previous night.

In an office building the use of a fan to provide ventilation and circulation to all of the rooms occupied will add to the comfort of the occupants. Frequently there is available an existing duct sys-

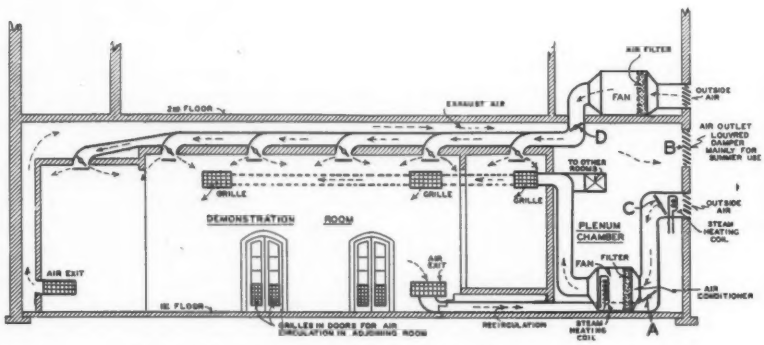


Fig. 1—Schematic Diagram of Air Condition System, Muncie Office Building

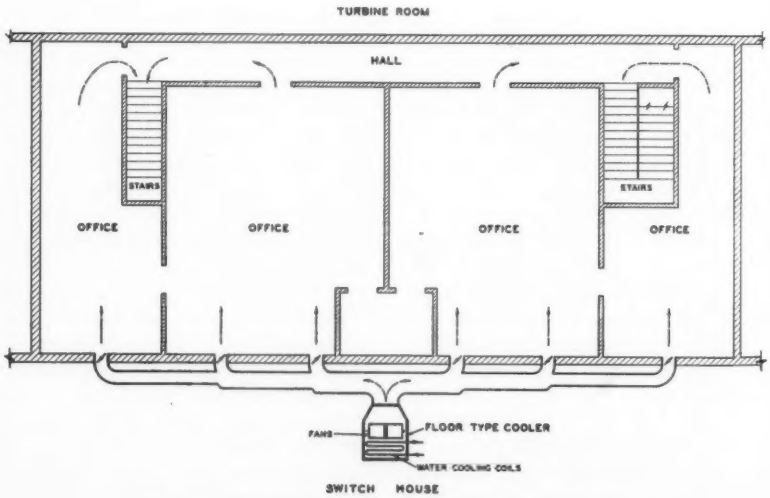


Fig. 2—Schematic Diagram of Air Condition System, Windsor Office Space

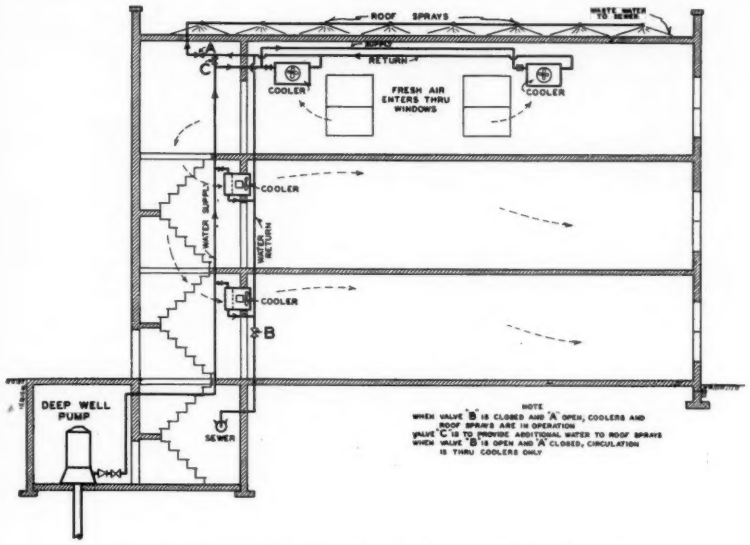


Fig. 3—Schematic Diagram of Air Condition System, Huntington Office Building

tem which was installed for hot air heating and this, although generally not adequate by itself, can be partly utilized for providing air circulation in other than the heating seasons. Fig. 1 shows such an installation. In this case the old system was left intact for winter use. The new ventilating system was superimposed on the old system at a cost of only $800, with much comfort and satisfaction to the occupants of the building.

Ventilation and Cooling

The next step in air conditioning includes the use of a cooler as well as a fan. The administrative portion of a power house was located so that it had no windows and depended on sky-lights for both ventilation and light. This space will eventually be converted to other use and for that reason the expenditure was held to a minimum. However, the installation of a Buffalo unit cooler supplied with cold water and an exhaust fan rated at 4200 cfm provided a reduction in the room temperature of 8 to 10 deg. below outside temperature, and the entire office force was quite well satisfied with the relief which was obtained. Fig. 2 is a diagram of this installation.

The application of cooling and circulating is also shown in Fig. 3. In this instance an old office building required treatment to make the working space more livable during the hot summer days. It is anticipated that this building will be replaced in a relatively short time and a more elaborate system could not be justified in view of this. A deep well with pump was installed to provide the source of water for cooling for this system and in the new building cooling for the refrigerating units for a complete air conditioning system. In this case cooler units were installed on each floor and means provided for obtaining fresh air through the windows on the top floor. This air was exhausted through the windows on the lower floors. In addition to the room coolers, roof sprays were installed over the entire building. The evaporation of the water from these roof sprays has quite a substantial additional cooling effect.

Complete Air Conditioning

The next step in air conditioning is the installation of all-year-round air conditioning, which involves complete treatment of the air throughout the year so as to insure ideal conditions at all times. In this particular installation, shown in Figs. 4 and 5, it was found economical to use three forms of cooling—that is, mechanical refrigeration, water cooling, and roof spraying. This is a two-story and basement corner build-

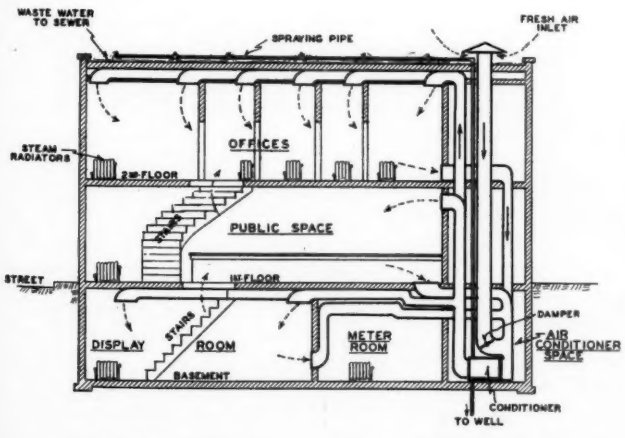


Fig. 4—Schematic Diagram of Air Condition System, Ashland Office Building

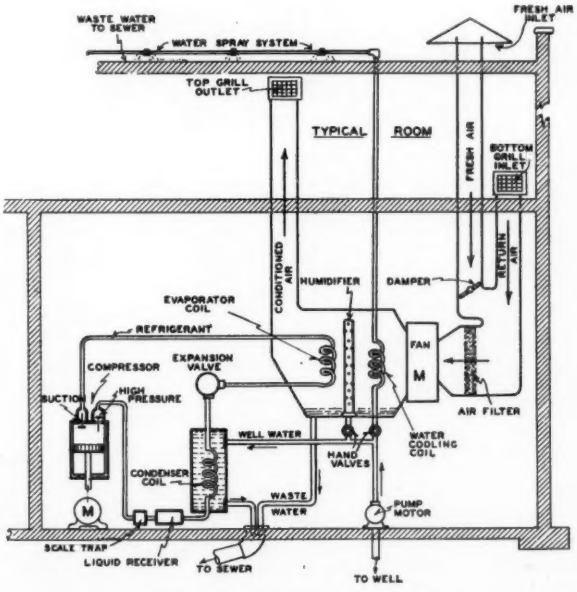


Fig. 5—Air Conditioner Layout Diagram, Ashland Office Building

ing with an all-day sun exposure, in an Ohio river bottom town.

The basement of the building is devoted to display and demonstration space and offices.

The first floor has commercial and office space and display space, and the second floor is occupied by the general office. In this case the fresh air is taken in from the roof and is mixed with the circulating or return air and then drawn through a fan. In the summer time it is first cooled by the cold water coils shown on the right of the cooler and then by the refrigerator coils on the left. In the winter time the humidifier adds moisture to the air, while in the summer time the dehumidifier extracts moisture. This entire air conditioning installation called for 22 tons of refrigeration—of this the mechanical refrigeration, that is, the compressor, supplies 12 tons, water cooling 7 tons, and the roof spray 3 tons.

One of the most interesting air conditioning installations made up to the present time is shown schematically in Fig. 6. This is a small office building

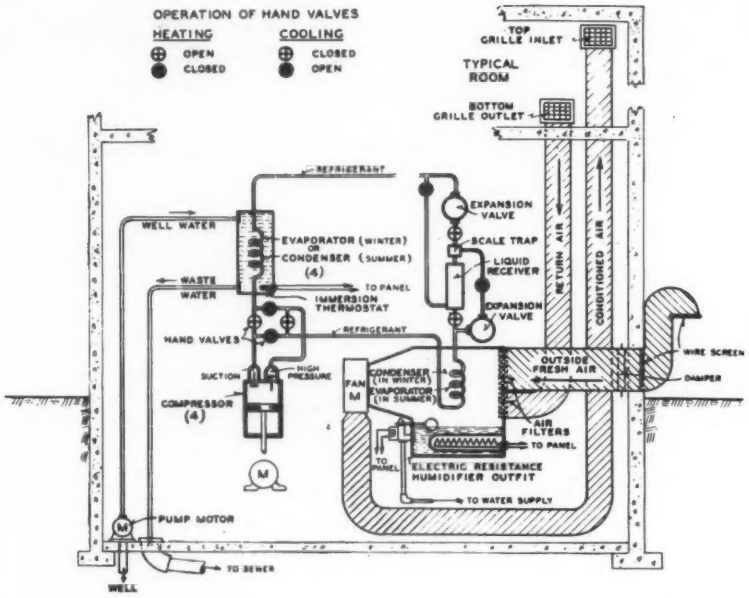


Fig. 6—Schematic Layout of Heating System, Salem Office Building

Fig. 7—Salem Office Building

in which mechanical refrigeration is used for cooling in the summer time and the same equipment used as a heat pump for heating the entire building in the winter time. The building—a two-story and basement office structure, is shown in Fig. 7. In this installation a deep well is used both for dissipating the heat from the compressor in the summer time, and for supplying the heat to the compressor unit in the winter time.

Fig. 8 shows the heat balance diagram upon which this system is designed. The system has operated through two summers and one winter, supplying satisfactory conditions at all times.

Air conditioning installations are largely assemblies of various types of apparatus to accomplish the overall purpose desired. The available apparatus and its functions were covered in considerable detail and the following is a brief outline of some of the more important items which enter into such an assembly.

Apparatus Constituting Elements of Air-Conditioning Systems

Before attempting to describe the component pieces of apparatus from which air-conditioning systems are built up, it may be well to review briefly the principles involved in *mechanical* refrigeration, on which so much of modern air conditioning depends. The term "mechanical" refers to use of power (vapor-compression system) or heat (vapor-absorption system) as a means of achieving a cooling effect, in distinction to "natural" cooling with ice, water, air, etc. The refrigeration effect in either case comes from the evaporation of a liquid admitted to a pipe coil or to some sort of a vessel—absorbing from surrounding substances the necessary latent heat of evaporation. In the vapor-compression system, application of electricity is by motor drive for a compressor, the duty of which is twofold: (a) to maintain a low pressure (or partial vacuum) in the evaporator chamber, that will cause the liquid to boil at the desired low temperature, and (b) to draw off the vapor formed and to compress it sufficiently to bring about condensation when the latent heat previous-

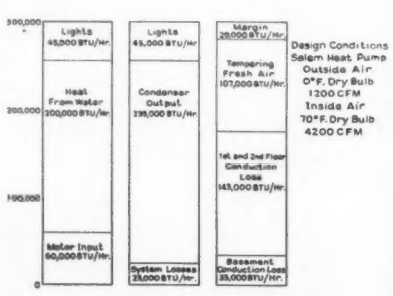


Fig. 8—Heat Balance Diagram, Salem Office Building

ly absorbed is again abstracted by a stream of water or a blast of air, thereby restoring the original liquid state.

If liquids suitable for producing refrigeration were plentiful and cheap, they could be used just once and the vapor generated allowed to escape to the atmosphere. However, most refrigerants are too expensive to waste, and hazards of explosion or suffocation may be created when their vapors mix with the atmosphere; these factors constitute the justification for the expense and complication involved in mechanical refrigerating systems. Furthermore, the danger from escape of vapors, which would be quickly spread throughout the air-conditioned space in a building, limits the choice of refrigerants to a few non-flammable nontoxic substances, or calls for use of chilled water or brine as an intermediary between the refrigeration-producing equipment, remotely located, and the air-treating apparatus near or within the air-conditioned space.

Cooling (Evaporator) Coils

Cooling coils employed in air-conditioning work are designed on the principle that resistance to transmission of heat occurs principally on the air-contact side. Accordingly, ribs or fins of some kind are provided on the exterior of each tube constituting the coil, in order to break up the air flow into thin streams and thus secure more intimate contact with the cold surface. By such means, temperature difference between air and cooling fluid is minimized, keeping down the size of coil needed and permitting use of a warmer refrigerant. This makes for low consumption of energy by motor-driven compressors, and where city water or supply from a well is utilized directly for cooling and dehumidification, decreases the amount consumed.

Humidifiers

Humidifiers are of many types, including:

(a) Heated pans filled with water, over which air is caused to flow; these are usually an integral part of a warm-air heating furnace.

(b) Mesh cells of wire screen or metallic wool, kept wet by hot water trickling from an overhead distributor trough.

(c) Finned coils used primarily for heating, but supplied with water trickling over the fins.

(d) Steam jets or orifices, supplied by connection from heating-steam pipe.

(e) Water jets using heated city water.

(f) Motor-driven centrifugal spray-generating device, in conjunction with fan rotor.

(g) Standard air washer, to be described later.

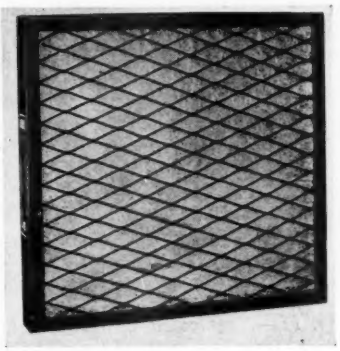


Fig. 9—Glass-Wool Filter Unit

Air Washers

Air washers are devices intended primarily for producing evaporation and for saturating air—at relatively high temperature when humidification is desired and at low temperature when dehumidification is wanted. Heating and mechanical refrigeration are involved, for controlling the spray-water temperature to produce desired temperature and moisture content of air leaving the washer. In some cases, city water or cool well water are employed for summer comfort-cooling applications. Air cleansing is also a major function accomplished by a washer.

Filters

Filters most commonly used for air-conditioning service consist of units 20 inches square by approximately 2 inches thick, having frames fitted with grilles of wire, expanded metal or slotted fiberboard at front and rear, confining wool of spun glass, metal, waste cordage fibers, or sterilized cattle hair. Usually the filling is impregnated with an odorless germicidal adhesive oil to arrest the finer dust particles. Some types are designed for washing and recoating when saturated with dust, but low-cost throw-away types predominate at present. A sufficient number of standard filter units are mounted in steel frame, to give the required total air-handling capacity, while maintaining velocity sufficiently low to insure effective removal of dust, soot, hay-fever pollens and other suspended particles.

Other types of unit filters employ cellulose tissue, or felt-like wool fabric stretched over a wire frame. The fabric can be cleaned periodically by means of a portable motor-driven vacuum cleaner. Typical makes of glass-wool and cloth filters are shown on Figs. 9 and 10. For application where dust concentration is heavy and frequent cleaning necessary, there is available a continuous-type filter constructed with large wool-filled panels mounted between a pair of endless chains passing over sheaves, and moved slowly by a geared electric motor through an oil bath.

Blowers

Blowers for air-conditioning service are generally of multi-vane type with forward-curved blades; scrolls, inlet cones, blades and tip speeds must be designed especially for quiet operation. Housings are often acoustically treated. Accurate balance of rotor to prevent vibration is required. For unit-type equipment, two or even three small fans may be mounted in line with rotors on a common shaft; alternatively, rotors may be mounted directly on single- or

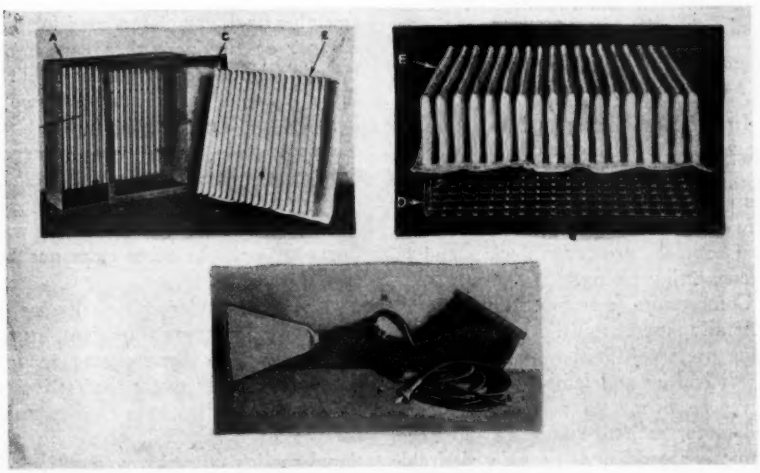


Fig. 10—Felt-Glove Unit Filter

double-end extensions of motor shafts. When independent fan shafts are used, anti-friction bearings are commonly provided. Fans should be mounted on vibration-absorbing bases of cork, rubber-like composition or coil springs.

For small volumes and low pressures, propeller-type fans are frequently used; recent research has yielded quiet-running designs of suitable pressure-volume characteristics and reasonably high efficiency.

Motors and Drives

Motors for driving compressors and fans, in the smaller size (under 5 hp), are generally single-phase capacitor or capacitor-start-and-run types, although the repulsion-induction type is also used. Single-phase motors predominate, although manufacturers would prefer to supply 3-phase for all except small fractional-horsepower sizes, if not limited by character and capacity of connections available. For motors 5 hp and larger, 3-phase service will ordinarily be practicable, depending on character and capacity of connections available. Designs giving low starting current, silent running and (in the case of compressor motors) high starting torque, are essential. Features to minimize lamp flicker and radio interference must be incorporated, coordinated with characteristics of the compressor. For automatically controlled units, when the starting torque of driven equipment permits, two motors with sequence relay for consecutive starting are sometimes direct-connected to the load, for holding current inrush to a low value. Devices known as "suction unloaders," permitting large air or refrigeration compressors to come up to speed without load, involve some complication and therefore are used only in commercial and industrial air-conditioning installations of considerable size.

Condensing Units (Compressors and Condensers)

In air-conditioning and refrigerating practice, the term "condensing unit" designates the compact assembly on a common bedplate, of a compressor with driving motor, condenser, liquid receiver, float controls, protective devices and interconnecting piping.

Compressors of reciprocating type are generally used, multi-cylinder designs being preferred, as they minimize starting difficulties and lamp flicker. V-belt drives from motors permit compressor and motor each to run at its most economical speed, and provide desirable resilience at the instant of starting.

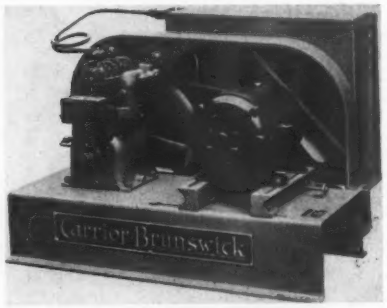


Fig. 11—Air-Cooled Condensing Unit

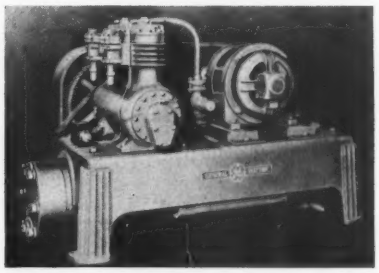


Fig. 12—Water Cooled Condensing Unit

Condensers cooled by means of water are of either double-tube or shell-and-tube designs, with the latter preferred when the cooling water carries dissolved or suspended solids; provision for opening and cleaning is desirable. Double-tube condensers are constructed with two concentric tubes or pipes, arranged so that cooling water flows through the inner tube and refrigerant from the condenser in the opposite direction through the annular space. A number of such elements may be connected in series by means of return elbows, and water from an overhead distributing trough may trickle over the entire group of elements. Shell-and-tube condensers resemble small condensers used for steam engines or turbines; they consist of a cylindrical cast-iron or welded-steel shell fitted with hollow chamber or heads at both ends. The interior is filled with closely spaced parallel tubes connected between the heads; refrigerant from the compressor occupies the space in shell surrounding the tubes, and cooling water flows through the tubes from one head to the other.

Air-cooled condensers usually are supplied with air by propeller fans, integral with compressor flywheels or mounted on compressor or motor shafts; in some designs, a small amount of water is sprayed over the coil, obtaining additional cooling effect by evaporation.

Figs. 11 and 12 show modern condensing units of rating less than 5 tons refrigeration — air-cooled and water-cooled respectively. Similar designs are available in sizes up to 20 tons. For larger capacities, reciprocating compressors, condensors, receivers, etc., are purchased separately and assembled on the site. A few makes of centrifugal compressor units, completely coordinated and factory assembled, are available in sizes up to 200 or 300 tons.

Commercial Aspects

The commercial departments of the utilities have taken an active interest in the installation of this equipment. The Commonwealth Edison established a branch devoted to the sale of air-conditioning equipment in 1933. At that time there was in use in Chicago only 28,000 connected horsepower for air-conditioning equipment. By the end of 1935 it is expected that there will be connected close to 50,000 horsepower represented by about 1,000 separate installations. This load represents an estimated revenue to the company of approximately $600,000.

This subject was first actively taken up by the Union Electric Light and Power Company in St. Louis in 1929, when there were only twenty installations. At the present time there is a total of 492 installations representing a connected load of over 10,000 kilowatts. Of these 193 are installed in residences, 101 in offices, 50 in retail stores, and 148 in other types of buildings, including theaters.

The Reports of the Air Conditioning Committee of Edison Electric Institute for 1934 and 1935 (publications B2 and C7) give more complete information on the status of air conditioning.

Unlimited Field

Air conditioning can and is being sold in sufficient quantities to be well worthwhile to the utilities to energetically promote this service to their customers. This available load is not confined to residences, offices and semi-public buildings, but to industry as well. Recently a manufacturer of machine tools installed complete air conditioning in the offices, laboratories and the section of the machine shop dealing with the development of new equipment. This resulted in better work and less spoilage. Plans are now being made to extend the installation throughout the entire factory. Likewise, one of the largest automobile manufacturers installed air conditioning in the foundry, with the result of better castings, healthier and happier employees.

Rural Lines Call for High Service Standards

By Arthur Huntington

Iowa Electric Light & Power Co., Cedar Rapids, Iowa

A paper presented before the American Society of Agricultural Engineers, Chicago, Ill., December, 1935

ON EITHER COAST, in the corn belt, or in the great experimental laboratory of the Southeast, there seems to have been only one road to a working knowledge of rural electric lines. Today, or one, two or three decades ago, those who have become interested in giving electricity to rural homes apparently have had to start from scratch and make the same mistakes and then proceed to correct them through a series of experiments and changes.

In the early days of the Committee on the Relation of Electricity to Agriculture, we used to say that a man's years of experience in rural electrification is pretty generally reflected in the mistakes he is making. It does not become any of us to point the finger of scorn or make humor at these mistakes, for each of us made them, and with all seriousness usually insisted on progressing by taking the next experimental step even though someone else had tried it and found it wanting.

Who is there of us who did not accept the Wisconsin added rural charge as a solution to the rate problem? How few there are who did not at some stage of their development convince themselves that with one customer per transformer, the core loss was a very major rural line problem.

In the Galva, Illinois, rate case out of which came the Committee of the Relation of Electricity to Agriculture, an engineer with a national reputation and much commission regulation experience presented a report in which he figured the transformer core loss at the maximum residential rate in the town of Galva and called that amount the differential between the cost of urban and rural service.

At a Michigan hearing it was proposed to develop each water power of from 1 to 10 horse power in order that the cost of producing the kilowatt-hour would be a minimum. In Virginia at least one of these farm power plants was built. Even the General Electric

MR. HUNTINGTON

Company suggested that with automatic control these small hydros could be developed and controlled from a central point. Great stress was placed on the value the line which would connect these small hydros would have in serving rural customers.

At one of these hearings Dr. Friday, then President of Michigan Agricultural College, called attention to the fact that capital costs, depreciation, obsolescence and upkeep were the major items of cost, and that the cost of power is an almost negligible item in the rural bill.

At one time it was seriously suggested that the utilities give to agriculture all of the kilowatt-hours necessary to promote rural uses of electricity for a period of five years. Free or nearly free use of electricity was made a part of the development of several of the early experimental lines. Strange as it may seem, the utility men who knew what a small part of the total cost the kilowatt-hour is were the most strenuous objectors. Their objections ranged from "a fear that the public who know the electrical costs only in terms of the kilowatt-hour as recorded by the meter and set out in the monthly bill would assume that the cost of current at the buss bars plus a percentage of profit would be a fair rate to the consumer," to a fear that "at a low rate the farmers would use so much current that the lines would soon be overloaded unless very heavy conductors were used."

Dr. Friday's statement was well known to nearly all utility executives except a few who came into the industry through the "financial door," but it was his statement that made the public and the industry as a whole realize that fixed charges are a major item of cost. Almost immediately cheap lines where the capital cost would be small became one of the industry's major problems, and, in a few weeks, the man who could build the cheapest line was the leader in the field.

Out on the coast a line was built using two by fours 22 feet long, made into A frames and nailed to stakes driven into the ground. If I recollect correctly the line cost about $200.00 per mile. If anyone is interested in the specifications he can get them by going back in the files of the *Electrical World*.

Lines using either iron wire or long spans on short poles or both were built everywhere. A line was built in Nebraska using iron wire on 6-inch, 30-foot poles set 12 to the mile. Several lines were built which used the ground return.

While the hysteria for cheap lines was a major problem for several years, there was little tried that had not been tried many years before. One of the very early rural lines of the corn belt was built by Mr. J. Renwick Lee, a Clarinda, Iowa, banker who wanted to live in the country and yet enjoy the comforts of the city. The line was built with common labor, using 20 to 25-foot oak poles, cut in the nearby woods, and set 250 to 300 feet apart. The conductors were a single iron wire and good old Mother Earth. The transformers

were fused on one side only. The transformer had one high tension bushing broken in shipment. On advice of the manufacturer's agent this bushing side of the transformer was connected to the ground, thus making it unnecessary to make repairs. This line gave service, such as it was, for several years. It finally went out of commission because the wire became largely a string of rust. Mr. Lee once told me that after the fourth year it cost more each year to repair the line than the original cost.

Many lines today are being built using modified specifications of this early line. They are being built by common labor and engineered by men who are responsible to political expediency. The fear that farmers would use an excessive amount of current soon faded, but it is still a major problem in not only rural lines, but is reflected in the rate structure in the whole electric field; to the average man cheap rate and large use is the solution of the whole public utility problem.

In the early nineties Hopkinson and Wright in England and Greene in this country set out quite clearly that capital costs are fixed and almost independent of the current used. Each of them demonstrated that increased use would be the greatest factor in reducing unit costs. In attempting to make this point clear each of them stated that if electricity was to come into general use, the unit costs must be lowered, and that these costs must be reflected in the rates. Each of them suggested a rate which contemplated a decreasing average cost as the use increased. Out of these suggestions and rate discussions and some increased uses which came from sales effort rather than rate reductions came the heresy that the increased use was the direct result of lowering the rates. Without going into detail, I will say that there is very little evidence to show that rate reductions have been more than an indirect factor in creating greater use. The increased use came from greater sales effort and the greater use naturally reduced costs.

The experience of the industry has been very convincing and for the most part has been rather bitter. About 1910 the industry, accepting the theory that reduced rates would increase use, cut the average rate for the nation from about 10 cents per kilowatt-hour to 8.4 cents. The leaders in the industry were sure that with the household appliances and a low rate the domestic load would grow very rapidly, and that they could well afford to use their sales effort to develop power. With the 10-cent rate the average domestic bill in 1910 called for 30 kilowatt-hours. A few years later with an 8.4-cent rate the use dropped to less than 23 kilowatt-hours. It took a 7-cent rate, and much sales effort, with about 12 years of time, to get the domestic bill back to 30 kilowatt-hours.

One of the objectives of the Garner rural line experiment was to learn how much current a farmer could use. To eliminate the factors of cost of current and equipment, the cost of current was made independent of the use and the equipment was furnished without cost to those who would cooperate. Eleven farmers cooperated and with the help of an extension man did learn to use upwards of 2,500 kilowatt-hours per year, whereas the 51 farmers who also received current at practically no cost without help increased their use very little. After the line was turned back to the farmers, even the cooperators became very ordinary users of current, while those farmers who did not cooperate fell off very little in their use.

A recent survey of 7,500 rural consumers showed that as a group the greatest use for any one month over a five-year period was less than 80 per cent of the current paid for in the minimum. Another survey revealed that a reduction of the minimum and the rate for current did not affect 50 per cent of the consumers, and that this 50 per cent used almost exactly one-half the current paid for in the minimum, and less than 10 per cent of the current called for in some of the "yardstick" rates. I might add that the cost of current on this line would just about double under the "yardstick" rates.

I have dwelt rather at length on these two points, because they seem to be fundamental heresies in the industry, more or less accepted by professionals and amateurs. Both of them are having a vital influence in rural construction at this time.

Many lines are being built using both public and private money where cheapness is the prevailing motive. They are being built cheaply in order that the rates may be low, which in turn will promote great use, which will further reduce the cost, which will in turn make further rate reductions possible, and at the same time make profits to the operators, and in turn will soon pay for the cheaply built line, all of which savors of the "muskrat cat farm."

For many years both potential users and promoters have made great claims as to the amount of electricity farmers would use if the rate were reasonable. The chairman of the Illinois Utility Commission who presided at the hearing of the Galva rate case expressed the opinion from the chair that with "reasonable rates" farmers would install electric pumps which would use enough current to make the whole line profitable thus placing the farm household uses on a parity with city uses. Mr. Edward Meredith, and Mr. Henry A. Wallace, both of whom rendered valuable service to the rural electric problem, expressed the opinion that corn belt farmers could and would use from $15.00 to $25.00 worth of electricity per month at the then prevailing rates.

Mr. George Rommell of the T.V.A. in an address at the 1934 mid-winter meeting of the southern section of the A.S.A.A. held at Memphis, Tennessee, stated that in the South rural lines would average about eight customers per mile, and that the consumers would average 800 kilowatt-hours per month per farm the first year, 900 kilowatt-hours the second year, 1000 kilowatt-hours the third year, and would gradually increase their use after that until 15,000 kilowatt-hours per year would be a fair average use. So specific was he, that he referred to a typical mile on which there were ten houses of which he proposed to get eight. Pictures of these ten houses were shown in a copy of the *Electric Light and Power* a few weeks later.

The industry at the present time has had ample experience to show that farm uses of current are rather limited and that those uses which are possible require much less current than was expected. Instead of the farmer making quick use of the service which is available he shows caution in the purchase of equipment, and in its use after installation. Much of this caution is the result of the political and socialistic attacks being made on the utilities. Reduced price for equipment has not made the farmer buy, and reduced rates have not made those who have equipment more than moderate users. The industry, the promoters, and the professional friends of the people are beginning to appreciate that the farmer must be sold and that there must be enough profit in the sale of appliances to pay sales costs, and the rate must be sufficient to support the line from present uses, and that these uses will increase rather slowly and only after con-

centrated sales effort. Above all the farmer must be made to know that the present rates are the bottom.

With the use of current relatively fixed, and limited as it surely is, and will be for several years to come, the type of line which must be built to meet this service is comparatively fixed. In other words the line of the future must be designed by men with a knowledge of the materials best suited for the use, and so use that material that it will render a maximum of service at a minimum of cost. Men able to make such intelligent use of materials are usually called engineers.

Of course, all industries are called upon to pay for the inexperience of people, and these costs are passed on to somebody. The industry pays for this inexperience, and is successful or goes bankrupt in proportion to its ability to pass these expenses on to the people. At the present time, the public is trying to decide whether it is better to pay for inexperience and through the promotion departments of the electric industry or through a tax bill. But that is no part of this paper.

I have already referred to early rural lines; compared them with some of the lines which are being built today which consist of one hot wire and one which is merely intended to assist the earth in acting as a return requiring one bushing transformer, one fuse block and one lightning arrester, long pole spans and conductors which are stretched to the limit of their mechanical strength and with carry capacity decidedly limited. Relief labor and local materials are a factor in many places. Standards of construction some of which have been built up after years of experience and in some places given the stamp of commission approval are being broken down. In Iowa the Railway Commission is trying to maintain its standards against pressure from the R.E.A. In Illinois there is a case before the commerce commission where the vital issue is supposed to hinge on states rights. In reality the question at issue is: Shall Illinois maintain its present standards of construction or shall the standards be made at Washton?

The standards for rural line construction reached a maximum about 1928 to 1930. A copy of the rules by the Bureau of Standards dated April 15, 1927, set the present standard of line construction. About that time the electrical industry joined hands with the State commission and by 1930 high standards were pretty generally accepted.

In preparing this paper, I reread several papers of that period all read before meetings of national importance; I also studied the specifications of some of the early lines. Most of us have forgotten that prior to that date rural lines were built down fence rows with 25-foot small top poles with two-pin cross-arms and small copper or iron wire tied to cheap insulators. Transformer racks were few and far between. If there were any cross-arm braces, they were short and usually only one to the arm. The specifications of 1923, when the C.R.E.A. was organized, as a rule provided for lines of this class. Why say specifications? Most of the lines of that date were simply built by farmers with the assistance of the local electrician or a boomer lineman.

Compare this with standards recommended by Mr. John M. Drabelle in a paper which was read before the mid-west section of the N.E.L.A. held at Omaha, Neb., April 24, 1929. I use this paper because it was *the* paper of the year for the heavy loading district. That same year similar papers were prepared in which were discussed the best practices in the medium and light loading districts. The high points of all of these papers were:

1. Locate rural lines on regularly traveled highways.
2. Use not less than 30-foot poles of a good class.
3. Use only four-pin cross-arms and provide for a second arm.
4. Use good hardware and insulators.
5. Use conductors of ample capacity, nothing less than No. 6 copper or No. 4 aluminum.
6. Use pole spacing of from 175 to 200 feet maximum and pull all wires with a dynamometer (a factor of mechanical strength of 2.3 is recommended as the minimum). The paper sets out that the Aluminum Company of America was experimenting with 300 and 330-foot spans where the wire was pulled so that the stress is 70 per cent of the ultimate strength at 20 degrees below zero.
7. The paper lays special stress on the necessity for standard transformers properly protected with the best fusing devices and lightning protection available—all placed on a suitable rack. There is more rural line trouble which centers around cheap fuse block and lightning arresters than all other causes combined.
8. This was the first paper which I found which advocated a good transformer rack and ample guying. It also calls attention to radio interference.
9. When this paper was written, outside metering was in the experimental stages. At the present time, outside metering is not only practical but advisable.
10. Few rural installations have proper grounds. There should be an adequate ground on each transformer neutral, lightning arrester, and meter box. Where conduit is used, the conduit should be grounded.

Nearly all of the papers and specifications prepared after 1929 which I studied referred repeatedly to the Underwriters Code on material and to the Safety Code put out by the Bureau of Standards.

In order that I might know more of the rural problems of today, I made a study of the trouble calls which have come in from several widely scattered lines. I could recite a long list of causes for these calls but the trouble reports were almost always—"the service is off." The farmer is exacting in his service requirements. It means little to him whether it is a broken wire, a fuse knocked out by lightning, a tree across the line or what not. He just has no service. As rural users increase, the service exactions will increase. From the trouble slips studied, it would seem that a range outage is the unpardonable sin. The city woman can get a meal with a can opener, but not so with the farm woman. The preparation of a farm meal is a major operation, and as a rule calls for much more cooking than the city meal.

The second thing of importance seems to be the farm yard light, which has developed in a few years from a 60 to 100-watt lamp on a pole to a 300 to 500-watt lamp placed at a position where it will light the whole farmstead and make most town street lighting look rather small.

All in all, rural lighting requirements are even now calling for the highest type of service which in turn means construction standards on a par with the best city distribution systems.

The present day "ballyhoo specifications," and you know what I mean, contemplate a line which will not fall down for 15 or 20 years, with little attention being paid to cost of upkeep on the part of those who will be responsible for the line, or continuity of service after age has started to reveal the weak spots of poor construction.

The politician who is living in the present is now writing the specifications, and making rural rates. Some day, not many years in the future, the whole rural problem will not be handed back to the engineer, but literally forced on him to be put in order. Of course the major part of the problem will be given to the agricultural engineer.

One Lighting Campaign After Another—Quota Exceeding Becomes a Habit

By Mack Gilbert

General Lighting Sales Department, The Tennessee Electric Power Co.

THE year 1935 was a record one for the Lighting Sales Department of The Tennessee Electric Power Company, and especially for its Home Lighting Advisers.

Many transformations are taking place in homes, stores, offices and manufacturing plants largely as a result of work being carried on by the various groups in the Company's Lighting Sales Department. Much has been and is being accomplished toward making home life more enjoyable by providing better light for reading, sewing, studying, etc. Probably the most outstanding lighting improvements, however, have been made in stores and service stations. The windows in the average stores in almost all Tepco towns are now better lighted than ever. Interior lighting is also much improved for benefit of customer and the store owner alike, because the customer buys with more confidence and buys more than he did when the stores were not so well lighted. In industry better lighting is improving the quality of work, is reducing fatigue caused by eyestrain, and is speeding up production and reducing accidents, just to mention a few of the many advantages of better lighting in a manufacturing plant.

In 1935 the Lighting Sales Department adopted promotional methods similar to those of the Company's Merchandise Sales Departments and has gone forward at a rapid pace as a result. Four lighting campaigns were held during the year. A brief review of the four campaigns, all of which exceeded quota, tells a success story.

A spring activity ran from April 1 through May 25 with quotas set up in three lighting divisions . . . commercial, industrial and residential. The results were far beyond expectations. When the final check-up was made, it was found that the Company had attained 214 per cent of quota. A breakdown showed the following results:

	Kw Quota	Kw Sales	% Quota
Commercial	1,000	2,464.7	246
Industrial	155	487.5	315
Residential	660	944.3	143
Total	1,815	3,896.5	214

This was by far the best activity the Company has staged to date. Hats were off to the young ladies on the home lighting staff who sold 944 kilowatts to residential customers in eight weeks and who, at the same time, were educating customers in the science of seeing.

Summer Campaign

Before anyone had an opportunity to get over that whirlwind spring activity, a small customer home lighting campaign was started. Summer being the hardest time of the year to sell lighting, coupled with the fact that the small residential customers—those having bills of $1.50 per month or less—were the potential prospects, the outlook was in no way rosy. This activity started June 10 and continued through August 3. An entirely new idea was incorporated of basing the final results partly on the sale of lighting equipment. A shade unit campaign was carried on in conjunction with the lighting campaign. The unit featured sold for 50 cents and included a twelve inch bridge shade, equipped with a 100-watt inside frosted Mazda lamp.

This was a novel idea, and there were a few doubtful minds, but on August 3 the final reports showed that the girls had again come through with their usual zest, selling 4,229 units against a quota of 2,800, or 151 per cent. Also they had sold a total of 803 kilowatts of home lighting. The campaign ended in a blaze of glory with 124 per cent of quota sold.

At the same time a small customer commercial lighting activity was carried

Frequent group meetings of employees help to sell the story of better light and Tepco. This picture is of a group of East Tennessee district employees taken recently during such a meeting. The program included: Picture-Light for living, play by representatives of the Chattanooga Home Lighting Department and information on the campaign then in progress.

on. Prospects were limited to customers having a total connected lighting load of two kilowatts or less. In this field equipment was also a major feature and the overall results of the activity were judged largely from this standpoint. The feature unit was an Adapterlite, which consisted of a sixteen inch glass fixture and an adapter ring that converted four inch commercial holders to six inch holders. During the eight weeks a total of 406 units was sold. The commercial men did a wonderful job, selling 803.3 kilowatts for 243.4 per cent of quota.

Fall Campaign

On September 16 the kilowatt gun was loaded again and the lighting sales personnel started on a new seven weeks' load building activity. Comparatively high quotas were assigned, but when the seven weeks were up the commercial lighting salesmen had attained 208.8 per cent of quota and the home lighting advisers had reached 239.7 per cent of their quota. Results by districts follow:

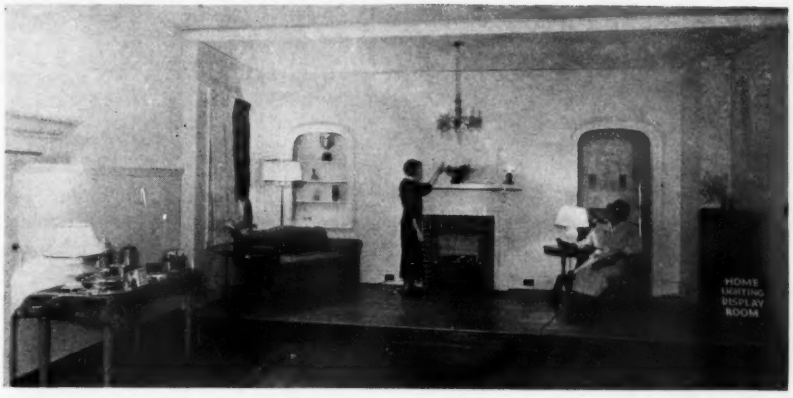
District	Residential	Commercial
1. East Tennessee ..	407.8%	232.4%
2. North Tennessee.	322.3	105.6
3. Middle Tennessee	311.5	224.4
4. Cumberland	218.6	126.0
5. Nashville	202.0	252.7
6. Chattanooga	178.3	193.5
Average	239.7%	208.8%

Christmas Activity

The final campaign of 1935 started on November 4 and continued through December 14. It was known as the Christmas Saving Club Lighting Activity. Unlike the first three campaigns, no quotas were established. Instead a savings club certificate was issued to each person participating, with places provided for Christmas bonus stamps. Each stamp had a value of $3.00. Commercial and industrial salesmen earned one stamp for each three kilowatts of new lighting load added, while the home lighting girls earned one stamp for each $100 of estimated new annual lighting revenue. Stamps were pasted on the certificates, which were redeemed at their face value prior to Christmas.

Seventeen men participating in the activity sold 1181 commercial lighting jobs, adding 1240.8 kilowatts of new lighting to the Company's lines.

In the Home Lighting Division, 31 home lighting advisers sold 3,418 jobs, adding 753.9 kilowatts of new lighting to the lines.



Chattanooga Home Lighting Advisors dramatize the story of better light before various groups instead of lecturing to them. Here is a scene in which Home Lighter Elizabeth Bailey, Chattanooga, convinces Mandy (played by Chattanooga's Juanita Walters) of the value of good lighting. These playlets have proved very valuable in selling better lighting. Better attention is secured—the subject is put over in an easy and humorous manner—and those in attendance have learned about better lighting almost without knowing it.

Fall Food Show, Nov. 5-12, City Auditorium, Chattanooga, Tenn. Ten thousand people registered at this booth . . . a thousand requested lighting surveys be made of their homes.

ONE MILLION I.E.S. SIGHT LAMPS SOLD

The National Better Light-Better Sight Bureau has been advised that the one millionth certification tag was sold by I.E.S. on January 4th. Eighteen months ago the specification for these special Better Light lamps were drawn and the first tag sold shortly after. The sales volume of these lamps is an extraordinary accomplishment.

The quick public acceptance and the energetic promotional and sales activities of utility Lighting Departments accounts largely for the result to date. Continued aggressiveness is anticipated by utilities on an even larger scale as these lamps are effectively educating the public to the value of more light for better seeing and are proving substantial revenue producers.

CORRESPONDENCE

Better Light-Better Sight—The McGraw Award

December 16, 1935.

MR. BERNARD WEADOCK
Edison Electric Institute
420 Lexington Avenue
New York, N. Y.

Dear Mr. Weadock:

Ever since last Tuesday night I have been wanting to find the time to write to you and express my very great appreciation for the part which the Edison Electric Institute played in this year's McGraw Award. My thanks go particularly to those individuals who were instrumental in bringing the Edison Electric Institute's Better Light-Better Sight activity to the attention of the Award Committee.

I am grateful jointly to the Institute and to the Illuminating Engineering Society for the banquet, which needs no recommendation from me because everybody, it seemed, was there and enjoyed it for themselves.

I want also to express my appreciation to all of the men and women, in the electric industry and out of it, who really made the Award possible. I am most sincere when I say that accomplishments twenty years ago, which Mr. Skinner and I then had never heard of, reached fruition last Tuesday night; that mechanical devices, without which there could have been no Better Light-Better Sight, brought, that evening, to their developers and marketers a part in the recognition and that literally hundreds of people were really being recognized. If I can understand that I have accepted my part in the Award as a sort of a trustee for each of those who made it possible, I will be very happy indeed.

To me, Better Light-Better Sight is practically synonymous with Merrill Skinner. He mostly carried the flag and, with three others, was responsible for extending it as a cooperative activity beyond the electric power industry. He headed the working committee which made Better Light known to all but a few in this entire country. His associates on this committee were Freeman Barnes, Joe O'Brien and Ernie Greenwood. These men were aided materially by Glen Trumbull and the entire organizations of the Edison Electric Institute and of the Illuminating Engineering Society. These groups can be depended upon to do well that which they start out to accomplish.

As a result, Better Light-Better Sight has become more than just a commercial activity. Based upon sound economics, it has developed a social significance for millions of people. Better home conditions and working places and better seeing are more than mere money makers—they make for better living and a fuller life. "Better Light-Better Sight" is a vehicle for the creation of real wealth. If real wealth is only that which, through labor, can be extracted from the sky or the waters or the earth and made useful for people—and I believe this is true—and if Better Light through Better Sight can increase the ability of labor to produce such wealth and the ability of people to avail themselves of it, I submit that this activity in which so many of us have shared is a definite contribution to sound, economic national development.

And, one thing more: I suggest that "Better Light-Better Sight" is an admirable example of the benefits to humanity of that recently at times maligned characteristic—individual initiative. Initiative brought the early researches into the relation between light and sight, produced the ever more efficient incandescent lamps and their increasingly improved application and use, inspired those who have produced more and more effective light-measurement devices and, finally, organized and started on its way that which we know now as "Better Light-Better Sight."

Again, thank you very much. You have made me very happy and I am sincerely grateful and appreciative.

Very truly yours,

GEORGE E. WHITWELL.

Philadelphia, Pa.

1935 Proceedings of NARUC

The proceedings of the National Association of Railroad and Utilities Commissioners at its convention, held in Nashville, Tennessee, on October 15-18, 1935, have been published and are for sale by the official reporters of the Association, The State Law Reporting Company, 30 Vesey Street, New York, N. Y. The proceedings contains 500 pages and is priced at $6.00 per copy.

Federal laws affecting the public utilities, and the problems they give rise to in their practical operation, together with the means of administering the laws, were discussed at the convention. The proceedings contain the discussions in full, together with addresses made by officials in the regulatory field.

The significance of the recent court decisions as affecting public utility regulation also came in for discussion at a full session of the convention; and the printed proceedings contain an extensive review by lawyer members of the Association of judicial rulings.

What the State commissions have done, and are attempting to do, and how, is covered by another part of the proceedings devoted to "State commission regulation and its results."

SALES MEETINGS IN MARCH

The week of March 23rd will be an important one in the schedule of commercial activities for the year. At Chicago, on Monday and Tuesday, March 23rd and 24th, there will be held a National Power Sales Conference.

On March 24th also there will be a meeting of the Regional Directors, Members-at-Large, and Executive Committee of the National Kitchen Modernizing Bureau.

On Wednesday and Thursday, March 25th and 26th, the Third Annual General Sales Conference will be held.

On Friday, March 27th, there will be a meeting of the Sales Committee.

All of these meetings, sponsored by Edison Electric Institute, will be held at the Edgewater Beach Hotel, Chicago.

POWER SALES ITEMS

AIR CONDITIONING

"Modernizing Bakeries." *Bakers Weekly,* December, 28, 1935, pp. 41-42. American Trade Publishing Co., Inc., Publishers, 45 West 45th Street, New York City.

A discussion of the factors involved, with special reference to the importance of air conditioning.

"Growth of Air Conditioning During 1935." *Electric Refrigeration News,* December 25, 1935, p. 1. Business News Publishing Company, Publishers, 550 Maccabees Building, Detroit, Mich.

Notes and statistics from eight cities, including Pittsburgh, which showed an increase of 200 per cent in connected capacity.

"Conditioned Air; No Drafts," by R. B. Purdy, Associate Editor, *Power,* November, 1935, p. 580. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

An article reviewing the factors to be watched and methods of distribution that have proved successful in remedying poor air distribution which is the cause of much discomfort in air-conditioned rooms.

"Chart for Determining Investment Return on Air Conditioning." *Power,* November, 1935, p. 604. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Number 38 of Power's data sheets giving a chart to determine how much additional space must be rented to break even.

"Dearborn Inn Completely Air Conditioned." *American Artisan,* November, 1935, pp. 30-31. Keeney Publishing Company, 6 North Michigan Avenue, Chicago, Ill.

One hundred-room Ford-controlled hotel has shown large increase in business due to complete air conditioning.

"Air Conditioning Modernizes Library; Promotes Efficiency, Protects Books," by F. J. Cummings. *Heating, Piping and Air Conditioning,* December, 1935, p. 565. Keeney Publishing Company, 6 North Michigan Avenue, Chicago, Ill.

How the James J. Hill reference library in St. Paul was equipped for year 'round air conditioning.

DIESEL ENGINES

"How Many Diesels—What Size." *Power,* November, 1935, p. 592. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

An article giving suggestions of the Diesel Engine Manufacturers' Association on capacity, service and load as the factors which govern selection of size and number of Diesels. Curves on Diesel fuel and lubricating oil costs from the 1933 ASME Power Committee are included.

"Cheap Shop Heat from Diesels." *Power,* November, 1935, p. 601. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

A small article explaining that Rockford Screw Products Company heats its shop for almost nothing through heat in Diesel jacket water.

"City Diesel Energy Costs Revealed." *Electrical World,* December 7, 1935, pp. 33-35. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Mr. Jay Samuel Hartt, Consulting Engineer of Madison, Wisconsin, made a survey of Wisconsin Diesel-electric muncipal plants for 1934 and compiled a report giving cost and operating data. The above mentioned article is an analytical summary of Mr. Hartt's report.

"Installation of Internal Combustion Engines." *Power Plant Engineering,* December, 1935, p. 673. Technical Publishing Company, 53 West Jackson Boulevard, Chicago, Ill.

Safety and reliability demand care in installation and use and the remarks taken from the recommendations of the National Board of Fire Underwriters give some of the requisites of good practice.

"Premier Gold Mining Company's 1,900 HP Diesel-Electric Power Plant Completed in Record Time." *Electrical News and Engineering,* December 1, 1935, p. 18 Hugh C. MacLean Publications, Ltd., 347 Adelaide Street, West, Toronto 2, Canada.

Three 630 HP, 541 KVA units installed and put into operation in short time to replace power plant destroyed by fire in British Columbia.

"Notable Diesel Installations in Foreign Countries." *Electrical News and Engineering,* December 1, 1935, p. 27. Hugh C. MacLean Publications, Ltd., 347 Adelaide Street, West, Toronto 2, Canada.

Trend towards using large Diesel plants for standby and peak load purposes.

ELECTRIC DRIVE

"New Ford Strip Mill." *Blast Furnace and Steel Plant,* December, 1935, pp. 833-839. Steel Publications, Inc., 108 Smithfield Street, Pittsburgh, Pa.

Description of hot and cold mill being installed at River Rouge, with notes on electric drive and heat applications.

ELECTRIC FURNACES

"Resistance Furnace Capacitors Cut Costs," by W. H. Austry and W. H. Cuttino. *Electrical World,* November 9, 1935, p. 32. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

An article dealing with the power factor correction of a large resistance furnace load in which 70 per cent PF was found due to the high inductive drop and its accompanying large currents.

HOUSE HEATING

"Electrically Heated Homes at Mason City," by H. G. Bender. *Electrical World,* December 21, 1935, pp. 36-37. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

The heating of dwellings in the Mason City Construction Camp is made possible because of certain load factor and rate schedules.

MINES

"Coal Mine Electrification." *Coal Age,* December, 1935, pp. 514-517. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Description of the electric equipment at the Lehigh Navigation Coal Company mines.

NEW INDUSTRY

"Synthetic Rubber." *The American Legion Monthly,* January, 1936, pp. 16-17. Legion Publishing Corporation, 129 East Market Street, Indianapolis, Ind.

Duprene, made from coal, limestone, common salt, and water, suggests a future power-using industry.

PLANT MODERNIZATION

"Modernizing a Malt House," by K. B. Humphrey. *Electrical World,* November 23, 1935, p. 30. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

A description of the electrical rehabilitation of the Interstate Malt Company plant in which some old equipment was utilized.

POWER PLANTS

"Small Steam Turbine Station Operates Entirely Unattended," by X Ides. *Power Plant Engineering,* December, 1935, p. 684. Technical Publishing Company, 53 West Jackson Boulevard, Chicago, Ill.

1000 kw combination back pressure and condensing turbine operates 100 per cent unattended in large industrial plant.

"Power Salesmen Pay Their Way," by R. D. Hayes. *Electrical World,* November 9, 1935, p. 70. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

A small article showing that power salesmen prove beneficial.

REFINERIES

"Electricity for Refineries." *American Petroleum Institute Proceedings,* December 13, 1935, pp. 1-10.

Costs compared for steam and Diesel power, with data on time required to retire investment. Joint operation of plants with utilities discussed favorably.

UNLOADING TOWERS

"Control of AC Unloading Tower," by H. L. Lindstrom, Pittsburgh, Pa. *Electrical World,* October 26, 1935, p. 34. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City.

Describes the several operating advantages over previous hoists due to mechanical and control features. Including barge-shifters, hopper-gate operation and all other power used in the tower, only .312 kwh/ton of coal unloaded is used.

Two New Books on Rural Electrification

Reviewed by DR. E. A. WHITE

Rural Electrification by J. P. Schaenzer. Published by The Bruce Publishing Company, Milwaukee, Wisconsin. Illustrated. 276 pages. Price, $1.72.

THIS publication is described as "A simple and concise yet comprehensive treatment of electricity and electrical mechanism as applied to rural America. It is dedicated especially to the vocational-agriculture teachers of the High Schools of America. It is hoped that it may also be of value to the agricultural engineering and home economics departments of the State Colleges of Agriculture, farmers contemplating or already having electric service, vocational schools, and the rural service men of the electric utilities of the nation."

The text is arranged especially from the standpoint of the teacher. Each chapter or lesson is divided into the following sections:

1. Class Discussion
2. Equipment
3. Demonstrations
4. Practice and Problems
5. Information
6. Suggested Readings.

The first chapter, entitled "Electricity, the Silent Partner," is devoted to discussion of why the farmer wants and needs electricity and a brief description of the growth of the farm electrification movement in the United States. Chapter II gives a brief discussion upon how electricity is made, featuring especially the generating station, while in chapter III is taken up the problem of getting service from the generating station to the farm customer, with a brief discussion on rural rates.

From this point the text branches into the utilization end, chapters IV, V, VI, VII, and VIII being devoted to wiring materials and wiring. There is a complete presentation of wiring materials, wiring maintenance and repair with concrete illustrations on the fundamentals of wiring the farmstead and different farm buildings. In these sections specific information is given on how to read a meter. Class exercises devoted to utilization subjects covering lights and lighting, electric motors, motor appliances, ensilage cutters, feed grinders, wood sawing, hay hoisting and baling, farm water supply, poultry-house lighting, electric incubation and brooding, the milking machine, cream separator, dairy refrigeration, the electric hotbed, laundry, and cleaning equipment for the house, kitchen and other household equipment are also included.

The illustrations and diagrams are intelligently chosen and well presented.

Electricity in the Home and on the Farm by Forrest B. Wright, New York State College of Agriculture, Cornell University, Ithaca, New York. Published by John Wiley & Sons, Inc., New York. Illustrated. 320 pages. Price, $2.50.

THIS book is well described as follows: "This book is written for those who wish to gain a practical knowledge of electricity and its applications in the home and on the farm. Although the book is designed with the needs of the school shop teacher in mind, the subject matter should be equally useful to the average householder and farmer. It is the aim of the author to present here such fundamentals and practical jobs as will aid the student to think for himself in terms of electricity and to acquire some of the more common skills in connection with its use. This point of view has been taken rather than one of specific applications alone because at the present rate of development of uses of electricity specific applications are changing almost daily, particularly with respect to equipment design, costs, efficiency, etc. With an understanding of the underlying principles involved in any application of electricity, the student may easily follow and understand the new developments in application as they appear."

This publication is really a thorough treatise on elementary electrical phenomena in which a certain number of practical agricultural and household applications are used in an adroit manner to illustrate the principles which are enunciated. It contains class exercises with questions and editorial material. It opens with a discussion on electric circuits; takes up batteries, bells, call systems, with illustrations. Then it goes into the problem of switches, lighting circuits, fuses, controls, insulation, and wire construction. As a followup, practical exercises are given on splicing conductors, making extension cords, installing switches, replacing sockets. One chapter is devoted to meter reading. Under the subject of "Wiring Systems for Light, Heat and Power," problems to be met in desirable installations for the home and farm buildings are taken up, with practical illustrations on how to install outlets, switches, etc.

Then the text branches into more technical electrical problems, taking up the theory and construction of a transformer, motors, with sections on how to build and operate this equipment and the care and repair of same. Following this, the theory of heating is gone into. In illustrating the principles involved, the toaster and grill are used. The question of storage batteries is given exclusive treatment. This will be useful especially in caring for and operating the automobile.

In the latter part of the book the theory of electricity is given with special emphasis upon electrical terms and measurement, magnetism, etc.

CONVENTIONS AND MEETINGS

JANUARY, 1936

9-11 American Engineering Council, Washington, D. C.
28-31 American Institute of Electrical Engineers, New York, N. Y.
27-28 Prime Movers Committee, Statler Hotel, Buffalo, N. Y.
31 Accident Prevention Committee, EEI offices, New York, N. Y.

FEBRUARY

1 Accident Prevention Committee, EEI offices, New York, N. Y.
3-6 National Electrical Manufacturers Association, Waldorf Astoria Hotel, New York, N. Y.
5-7 American Management Association, The Palmer House, Chicago, Ill.
10-11 Electrical Equipment Committee, Statler Hotel, Buffalo, N. Y.
13-14 Transmission and Distribution Committee, Netherlands Plaza Hotel, Cincinnati, Ohio.

MARCH

23-27 Third Annual Sales Conference and Sales Committee meetings, Edgewater Beach Hotel, Chicago, Ill.
23-24 National Power Sales Conference, Edgewater Beach Hotel, Chicago, Ill.

APRIL

23-25 Electrochemical Society, Cincinnati, Ohio.
27-30 Chamber of Commerce of the U.S.A., Washington, D. C.
29-30 Missouri Association of Public Utilities, St. Louis, Mo.

MAY

1 Missouri Association of Public Utilities, St. Louis, Mo.
11-14 National Fire Protection Association, Atlantic City, N. J.
25-28 National Electrical Manufacturers Association, Hot Springs, Va.

JUNE

17-20 The American Society of Mechanical Engineers, Dallas, Texas.
22-26 American Institute of Electrical Engineers, Pasadena, Cal.